The flexisym package

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Feedback: https://github.com/wspr/breqn/issues

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User's guide

For now, the user's guide is in breqn.

Implementation

1 flexisym

```
⟨*package⟩
\RequirePackage{expl3}[2009/08/05]
\ProvidesExplPackage{flexisym}{2015/08/11}{0.98d}{Make math characters macros}

\edef\do{%
  \noexpand\AtEndOfPackage{%
    \catcode\number`\"=\number\catcode`\"
    \relax
  }%
}
\do \let\do\relax
\catcode`\"=12
\let\@sym\@gobble
\DeclareOption{robust}{%
  \def\@sym#1{%
    \ifx\protect\@typeset@protect \else\protect#1\exp_after:wN\use_none:nnnn\fi
  }%
}
```

The math groups (mg) here relate to \textfont$n$.

```
\def\mg@bin{2}% binary operators
\def\mg@rel{2}% relations
%%\def\mg@nre{B}% negated relations
\def\mg@del{3}% delimiters
```

```
%%\def\mg@arr{B}% arrows
\def\mg@acc{0}% accents
\def\mg@cop{3}% cumulative operators (sum, int)
\def\mg@latin{1}% (Latin) letters
\def\mg@greek{1}% (lowercase) Greek
\def\mg@Greek{0}% (capital) Greek
%%\def\mg@bflatin{4}% bold upright Latin letters ?
%%\def\mg@Bbb{B}% blackboard bold
\def\mg@cal{2}% script/calligraphic
%%\def\mg@frak{5}% Fraktur letters
\def\mg@digit{0}% decimal digits % 1 = oldstyle, 0 = capital
```

This is how we insert mathchars. The command has three arguments: class, fam and slot postion and so it is always given as hexadecimal. This way of separating things should make it easier to get this to work with XeTeX et al. which have many more slot positions

```
\cs_set_protected:Nn \math_char:NNn {
  \tex_mathchar:D \__int_eval:w " #1#2#3 \__int_eval_end:
}
```

Delimiters and radicals are similar except here we have both small and large variant. Radicals have no class.

```
\cs_set_protected:Nn \math_delimiter:NNnNn {
  \tex_delimiter:D \__int_eval:w " #1#2#3#4#5 \__int_eval_end:
}
\cs_set_protected:Nn \math_radical:NnNn {
  \tex_radical:D  \__int_eval:w " #1#2#3#4 \__int_eval_end:
}
\cs_set_protected:Nn \math_accent:NNnn {
  \tex_mathaccent:D \__int_eval:w " #1 #2 #3 \__int_eval_end: {#4}
}

\let\sumlimits\displaylimits
\let\intlimits\nolimits
\let\namelimits\displaylimits
```

TEX defines eight types of atoms.

0. Ordinary
1. Operators
2. Binary
3. Relation
4. Open
5. Close
6. Punctuation
7. Inner

TEX defines eight math classes.

0. Ordinary
1. Operators
2. Binary
3. Relation
4. Open
5. Close
6. Punctuation
7. Variable family

flexisym/breqn extends this to types of classes.

0. Ordinary: (Ord), Bidirectional delimiters (DeB), Radicals (Rad), Accented items (Acc)
1. Operators: Cumulative Operators sum-like (COs), Cumulative Operators integral-like (COi)
2. Binary: (Bin)
3. Relation: (Rel), Arrow delimiters (DeA)
4. Open: (DeL)
5. Close (DeR)
6. Punctuation: (Pun)
7. Variable family: (Var)

Here's an overview of what we are about to do. Math chars of each type as defined by us need a basic operation for inserting it. We will call that function `\math_bsym_`⟨*type*⟩`:Nn`. Next there are compund symbols for each type which we name `\math_bcsym_`⟨*type*⟩`:Nn`. Also, there is inline mode and display mode which are different. We will call them for `\math_isym_`⟨*type*⟩`:Nn` `\math_icsym_`⟨*type*⟩`:Nn` for inline mode and `\math_dsym_`⟨*type*⟩`:Nn` and `\math_dcsym_`⟨*type*⟩`:Nn`. The code uses the terms `\math_sym_`⟨*type*⟩`:Nn` and `\math_csym_`⟨*type*⟩`:Nn` for the current meaning of things. First up the basic definitions. `#1` is the math group it is from and `#2` is the slot position.

```
\cs_new:Npn \math_bsym_Ord:Nn {\math_char:NNn 0 }% \m@Ord
\cs_new:Npn \math_bsym_Var:Nn {\math_char:NNn 7 }% \m@Var
\cs_new:Npn \math_bsym_Bin:Nn {\math_char:NNn 2 }% \m@Bin
\cs_new:Npn \math_bsym_Rel:Nn {\math_char:NNn 3 }% \m@Bin
\cs_new:Npn \math_bsym_Pun:Nn {\math_char:NNn 6 }% \m@Pun
```

```
\cs_new:Nn  \math_bsym_COs:Nn { \math_char:NNn 1 #1 {#2} \sumlimits }% \m@COs
\cs_new:Nn  \math_bsym_COi:Nn { \math_char:NNn 1 #1 {#2} \intlimits }% \m@COi
\cs_new:Nn  \math_bsym_DeL:Nn { \math_sd_del_aux:Nnn 4 #1{#2} }% \m@DeL
\cs_new:Nn  \math_bsym_DeR:Nn { \math_sd_del_aux:Nnn 5 #1{#2} }% \m@DeR
\cs_new:Nn  \math_bsym_DeB:Nn { \math_sd_del_aux:Nnn 0 #1{#2} }% \m@DeB
\cs_new:Nn  \math_bsym_DeA:Nn { \math_sd_del_aux:Nnn 3 #1{#2} }% \m@DeA
\cs_new:Nn  \math_bsym_Rad:Nn { \math_sd_rad_aux:Nn #1{#2} }% \m@Rad
\cs_new:Npn \math_bsym_Acc:Nn #1#2#3#4 {\math_accent:NNnn #1#2{#3}{#4}}% name is wrong

```

Next is somewhat complicated internally. The way it is done is that delimiters and radicals need information about the smallest version of the symbol. If this smallest delimiter (SD) is defined, then use it. We have these functions to help us return the number. Extract the numbers to use and stick a function in front of it.

Code changed because now we require the smallest delimiter to be defined (it may be the same, no problem in that). So the two arguments present in `\math_bsym_DeL:Nn` are the location of extensible version (where the font will do the rest for us automatically). For each delimiter, a pointer is defined using the extensible characters family and slot as name and value equal to family and position of the smallest version. For `(` in standard LaTeX this is `{del}{00}` and `{OT1}{28}` respectively. Hence, `\math_bsym_DeL:Nn \mg@del {00}` must expand to `\math_delimiter:NNnNn 4 \mg@OT1 {28}\mg@del{00}`. So first expand away to get to the smallest version. Then call next function which shuffles the arguments around.

```
\cs_set:Npn \math_sd_del_aux:Nnn #1#2#3{
  \exp_args:Nf \math_sd_del_auxi:nN {\use:c{sd@#2#3}} #1 #2{#3}
}
\cs_set:Npn \math_sd_del_auxi:nN #1#2{ \math_delimiter:NNnNn #2 #1 }
```

Same for radicals.

```
\cs_set:Npn \math_sd_rad_aux:Nn #1#2{
  \exp_args:Nf \math_sd_rad_auxi:n {\use:c{sd@#1#2}} #1 {#2}
}
\cs_set:Npn \math_sd_rad_auxi:n #1{ \math_radical:NnNn #1 }


% \cs_set:Npn \math_sd_aux:nn  #1#2 {
%   %\exp_args:Nnf \use:nn { #1}  { \math_sd_auxi:Nn #2 }
%   \exp_args:Nnf \use:nn { #1}  { \use:c{sd@\use:nn#2} }
% }
% \cs_set:Npn \math_sd_auxi:Nn #1#2 {
%    \cs_if_free:cTF {sd@#1#2}
%   {   #1{#2}  }
%   {   \use:c{sd@#1#2}  }
% }
```

compound symbols here

```
\cs_set_protected:Npn \math_bcsym_Ord:Nn #1#2 { \@symtype \mathord   { \OrdSymbol {#2} } }%\
\cs_set_protected:Npn \math_bcsym_Var:Nn #1#2 { \@symtype \mathord   { \OrdSymbol {#2} } }%\
\cs_set_protected:Npn \math_bcsym_Bin:Nn #1#2 { \@symtype \mathbin   { \OrdSymbol {#2} } }%\
```

```
\cs_set_protected:Npn \math_bcsym_Rel:Nn #1#2 { \@symtype \mathrel   { \OrdSymbol {#2} } }%\
\cs_set_protected:Npn \math_bcsym_Pun:Nn #1#2 { \@symtype \mathpunct { \OrdSymbol {#2} } }%\
\cs_set_protected:Npn \math_bcsym_COi:Nn #1#2 { \@symtype \mathop    { \OrdSymbol {#2} \intl
\cs_set_protected:Npn \math_bcsym_COs:Nn #1#2 { \@symtype \mathop    { \OrdSymbol {#2} \suml
\cs_set_protected:Npn \math_bcsym_DeL:Nn #1#2 { \@symtype \mathopen  { \OrdSymbol {#2} } }%\
\cs_set_protected:Npn \math_bcsym_DeR:Nn #1#2 { \@symtype \mathclose { \OrdSymbol {#2} } }%\
\cs_set_protected:Npn \math_bcsym_DeB:Nn #1#2 { \@symtype \mathord   { \OrdSymbol {#2} } }%\
\cs_set_protected:Npn \math_bcsym_DeA:Nn #1#2 { \@symtype \mathrel   { \OrdSymbol {#2} } }%\
\cs_set_protected:Npn \math_bcsym_Acc:Nn {\@sym}%\@symAcc FIX!
% These three?
\cs_set_protected:Npn \math_bcsym_Ope:Nn #1#2{\@symtype\mathopen{\OrdSymbol{#2}}}%\@symVar
\cs_set_protected:Npn \math_bcsym_Clo:Nn #1#2{\@symtype\mathclose{\OrdSymbol{#2}}}%\@symVar
\cs_set_protected:Npn \math_bcsym_Inn:Nn #1#2{\@symtype\mathinner{\OrdSymbol{#2}}}%\@symVar

\let\@symtype\@firstofone
\let\sym@global\global
```

The inline variants, using the basic operations. Currently we do not do anything to inline math.

```
\cs_new:Npn \math_isym_Ord:Nn { \math_bsym_Ord:Nn }% \m@Ord
\cs_new:Npn \math_isym_Var:Nn { \math_bsym_Var:Nn }% \m@Var
\cs_new:Npn \math_isym_Bin:Nn { \math_bsym_Bin:Nn }% \m@Bin
\cs_new:Npn \math_isym_Rel:Nn { \math_bsym_Rel:Nn }% \m@Bin
\cs_new:Npn \math_isym_Pun:Nn { \math_bsym_Pun:Nn }% \m@Pun
\cs_new:Npn \math_isym_COs:Nn { \math_bsym_COs:Nn }% \m@COs
\cs_new:Npn \math_isym_COi:Nn { \math_bsym_COi:Nn }% \m@COi
\cs_new:Npn \math_isym_DeL:Nn { \math_bsym_DeL:Nn }% \m@DeL
\cs_new:Npn \math_isym_DeR:Nn { \math_bsym_DeR:Nn }% \m@DeR
\cs_new:Npn \math_isym_DeB:Nn { \math_bsym_DeB:Nn }% \m@DeB
\cs_new:Npn \math_isym_DeA:Nn { \math_bsym_DeA:Nn }% \m@DeA
\cs_new:Npn \math_isym_Rad:Nn { \math_bsym_Rad:Nn }% \m@Rad
\cs_new:Npn \math_isym_Acc:Nn { \math_bsym_DeL:Nn }% name is wrong
% inline compound
\cs_set_protected:Npn \math_icsym_Ord:Nn { \math_bcsym_Ord:Nn }
\cs_set_protected:Npn \math_icsym_Var:Nn { \math_bcsym_Var:Nn }
\cs_set_protected:Npn \math_icsym_Bin:Nn { \math_bcsym_Bin:Nn }
\cs_set_protected:Npn \math_icsym_Rel:Nn { \math_bcsym_Rel:Nn }
\cs_set_protected:Npn \math_icsym_Pun:Nn { \math_bcsym_Pun:Nn }
\cs_set_protected:Npn \math_icsym_COi:Nn { \math_bcsym_COi:Nn }
\cs_set_protected:Npn \math_icsym_COs:Nn { \math_bcsym_COs:Nn }
\cs_set_protected:Npn \math_icsym_DeL:Nn { \math_bcsym_DeL:Nn }
\cs_set_protected:Npn \math_icsym_DeR:Nn { \math_bcsym_DeR:Nn }
\cs_set_protected:Npn \math_icsym_DeB:Nn { \math_bcsym_DeB:Nn }
\cs_set_protected:Npn \math_icsym_DeA:Nn { \math_bcsym_DeA:Nn }
\cs_set_protected:Npn \math_icsym_Acc:Nn { \math_bcsym_Acc:Nn }
\cs_set_protected:Npn \math_icsym_Ope:Nn { \math_bcsym_Ope:Nn }
\cs_set_protected:Npn \math_icsym_Clo:Nn { \math_bcsym_Clo:Nn }
\cs_set_protected:Npn \math_icsym_Inn:Nn { \math_bcsym_Inn:Nn }
```

The display variants, using the basic operations. Currently we do not do

anything to inline math.

```
\cs_new:Npn \math_dsym_Ord:Nn { \math_bsym_Ord:Nn }
\cs_new:Npn \math_dsym_Var:Nn { \math_bsym_Var:Nn }
\cs_new:Npn \math_dsym_Bin:Nn { \math_bsym_Bin:Nn }
\cs_new:Npn \math_dsym_Rel:Nn { \math_bsym_Rel:Nn }
\cs_new:Npn \math_dsym_Pun:Nn { \math_bsym_Pun:Nn }
\cs_new:Npn \math_dsym_COs:Nn { \math_bsym_COs:Nn }
\cs_new:Npn \math_dsym_COi:Nn { \math_bsym_COi:Nn }
\cs_new:Npn \math_dsym_DeL:Nn { \math_bsym_DeL:Nn }
\cs_new:Npn \math_dsym_DeR:Nn { \math_bsym_DeR:Nn }
\cs_new:Npn \math_dsym_DeB:Nn { \math_bsym_DeB:Nn }
\cs_new:Npn \math_dsym_DeA:Nn { \math_bsym_DeA:Nn }
\cs_new:Npn \math_dsym_Rad:Nn { \math_bsym_Rad:Nn }
\cs_new:Npn \math_dsym_Acc:Nn { \math_bsym_DeL:Nn }
% inline compound
\cs_set_protected:Npn \math_dcsym_Ord:Nn { \math_bcsym_Ord:Nn }
\cs_set_protected:Npn \math_dcsym_Var:Nn { \math_bcsym_Var:Nn }
\cs_set_protected:Npn \math_dcsym_Bin:Nn { \math_bcsym_Bin:Nn }
\cs_set_protected:Npn \math_dcsym_Rel:Nn { \math_bcsym_Rel:Nn }
\cs_set_protected:Npn \math_dcsym_Pun:Nn { \math_bcsym_Pun:Nn }
\cs_set_protected:Npn \math_dcsym_COi:Nn { \math_bcsym_COi:Nn }
\cs_set_protected:Npn \math_dcsym_COs:Nn { \math_bcsym_COs:Nn }
\cs_set_protected:Npn \math_dcsym_DeL:Nn { \math_bcsym_DeL:Nn }
\cs_set_protected:Npn \math_dcsym_DeR:Nn { \math_bcsym_DeR:Nn }
\cs_set_protected:Npn \math_dcsym_DeB:Nn { \math_bcsym_DeB:Nn }
\cs_set_protected:Npn \math_dcsym_DeA:Nn { \math_bcsym_DeA:Nn }
\cs_set_protected:Npn \math_dcsym_Acc:Nn { \math_bcsym_Acc:Nn }
\cs_set_protected:Npn \math_dcsym_Ope:Nn { \math_bcsym_Ope:Nn }
\cs_set_protected:Npn \math_dcsym_Clo:Nn { \math_bcsym_Clo:Nn }
\cs_set_protected:Npn \math_dcsym_Inn:Nn { \math_bcsym_Inn:Nn }
```

Almost ready now! Now just need two commands to initialize these settings.

```
\cs_set:Npn \math_setup_inline_symbols:
 {
  \cs_set_eq:NN \math_sym_Ord:Nn  \math_isym_Ord:Nn
  \cs_set_eq:NN \math_sym_Var:Nn  \math_isym_Var:Nn
  \cs_set_eq:NN \math_sym_Bin:Nn  \math_isym_Bin:Nn
  \cs_set_eq:NN \math_sym_Rel:Nn  \math_isym_Rel:Nn
  \cs_set_eq:NN \math_sym_Pun:Nn  \math_isym_Pun:Nn
  \cs_set_eq:NN \math_sym_COs:Nn  \math_isym_COs:Nn
  \cs_set_eq:NN \math_sym_COi:Nn  \math_isym_COi:Nn
  \cs_set_eq:NN \math_sym_DeL:Nn  \math_isym_DeL:Nn
  \cs_set_eq:NN \math_sym_DeR:Nn  \math_isym_DeR:Nn
  \cs_set_eq:NN \math_sym_DeB:Nn  \math_isym_DeL:Nn
  \cs_set_eq:NN \math_sym_DeA:Nn  \math_isym_DeA:Nn
  \cs_set_eq:NN \math_sym_Rad:Nn  \math_isym_Rad:Nn
  \cs_set_eq:NN \math_sym_Acc:Nn  \math_isym_DeL:Nn
  \cs_set_eq:NN \math_csym_Ord:Nn \math_icsym_Ord:Nn
  \cs_set_eq:NN \math_csym_Var:Nn \math_icsym_Var:Nn
  \cs_set_eq:NN \math_csym_Bin:Nn \math_icsym_Bin:Nn
```

```
  \cs_set_eq:NN \math_csym_Rel:Nn \math_icsym_Rel:Nn
  \cs_set_eq:NN \math_csym_Pun:Nn \math_icsym_Pun:Nn
  \cs_set_eq:NN \math_csym_COi:Nn \math_icsym_COi:Nn
  \cs_set_eq:NN \math_csym_COs:Nn \math_icsym_COs:Nn
  \cs_set_eq:NN \math_csym_DeL:Nn \math_icsym_DeL:Nn
  \cs_set_eq:NN \math_csym_DeR:Nn \math_icsym_DeR:Nn
  \cs_set_eq:NN \math_csym_DeB:Nn \math_icsym_DeB:Nn
  \cs_set_eq:NN \math_csym_DeA:Nn \math_icsym_DeA:Nn
  \cs_set_eq:NN \math_csym_Acc:Nn \math_icsym_Acc:Nn
  \cs_set_eq:NN \math_csym_Ope:Nn \math_icsym_Ope:Nn
  \cs_set_eq:NN \math_csym_Clo:Nn \math_icsym_Clo:Nn
  \cs_set_eq:NN \math_csym_Inn:Nn \math_icsym_Inn:Nn
 }

\cs_set:Npn \math_setup_display_symbols:
 {
  \cs_set_eq:NN \math_sym_Ord:Nn  \math_dsym_Ord:Nn
  \cs_set_eq:NN \math_sym_Var:Nn  \math_dsym_Var:Nn
  \cs_set_eq:NN \math_sym_Bin:Nn  \math_dsym_Bin:Nn
  \cs_set_eq:NN \math_sym_Rel:Nn  \math_dsym_Rel:Nn
  \cs_set_eq:NN \math_sym_Pun:Nn  \math_dsym_Pun:Nn
  \cs_set_eq:NN \math_sym_COs:Nn  \math_dsym_COs:Nn
  \cs_set_eq:NN \math_sym_COi:Nn  \math_dsym_COi:Nn
  \cs_set_eq:NN \math_sym_DeL:Nn  \math_dsym_DeL:Nn
  \cs_set_eq:NN \math_sym_DeR:Nn  \math_dsym_DeR:Nn
  \cs_set_eq:NN \math_sym_DeB:Nn  \math_dsym_DeL:Nn
  \cs_set_eq:NN \math_sym_DeA:Nn  \math_dsym_DeA:Nn
  \cs_set_eq:NN \math_sym_Rad:Nn  \math_dsym_Rad:Nn
  \cs_set_eq:NN \math_sym_Acc:Nn  \math_dsym_DeL:Nn
  \cs_set_eq:NN \math_csym_Ord:Nn \math_dcsym_Ord:Nn
  \cs_set_eq:NN \math_csym_Var:Nn \math_dcsym_Var:Nn
  \cs_set_eq:NN \math_csym_Bin:Nn \math_dcsym_Bin:Nn
  \cs_set_eq:NN \math_csym_Rel:Nn \math_dcsym_Rel:Nn
  \cs_set_eq:NN \math_csym_Pun:Nn \math_dcsym_Pun:Nn
  \cs_set_eq:NN \math_csym_COi:Nn \math_dcsym_COi:Nn
  \cs_set_eq:NN \math_csym_COs:Nn \math_dcsym_COs:Nn
  \cs_set_eq:NN \math_csym_DeL:Nn \math_dcsym_DeL:Nn
  \cs_set_eq:NN \math_csym_DeR:Nn \math_dcsym_DeR:Nn
  \cs_set_eq:NN \math_csym_DeB:Nn \math_dcsym_DeB:Nn
  \cs_set_eq:NN \math_csym_DeA:Nn \math_dcsym_DeA:Nn
  \cs_set_eq:NN \math_csym_Acc:Nn \math_dcsym_Acc:Nn
  \cs_set_eq:NN \math_csym_Ope:Nn \math_dcsym_Ope:Nn
  \cs_set_eq:NN \math_csym_Clo:Nn \math_dcsym_Clo:Nn
  \cs_set_eq:NN \math_csym_Inn:Nn \math_dcsym_Inn:Nn
 }
```

Phew, that was it.

Well, almost. We need to set them up for use properly. Should they be added to `\everymath`? Probably, for math within displays. However, this is a lot of extra processing which we could tackle in the display setup.

```
\math_setup_inline_symbols:
```

Need an active character for a second. Don't rely on ~ being active!

```
\edef\tmp{\catcode\z@=\the\catcode\z@}
\catcode\z@=\active
\def\DeclareFlexSymbol#1#2#3#4{%
  \begingroup
  \cs_set_protected:Npx\@tempb{
    \exp_not:N\@sym\exp_not:N#1\exp_not:c{math_sym_#2:Nn}
        \exp_not:c{mg@#3}{#4}
  }
  \ifcat\exp_not:N#1\relax
    \sym@global\let#1\@tempb
  \else
    \sym@global\mathcode`#1="8000\relax
    \lccode\z@=`#1\relax
    \lowercase{\sym@global\let^^@\@tempb}% zero char
  \fi
  \endgroup
}
\tmp % restore catcode
\cs_set:Npn \DeclareFlexDelimiter #1#2#3#4#5#6{
  \DeclareFlexSymbol{#1}{#2}{#3}{#4}
  \cs_gset:cpx{sd@\use:c{mg@#3}#4}{\exp_not:c{mg@#5}{#6}}
}

\DeclareFlexCompoundSymbol{\cdots}{Inn}{\cdotp\cdotp\cdotp} \def\@symInn#1#2{\@symtyp
\@symtype \mathinner{\OrdSymbol{\cdtop\cdotp\cdotp}}
\def\DeclareFlexCompoundSymbol#1#2#3{%
  \exp_args:NNo \DeclareRobustCommand#1{\csname math_csym_#2:Nn\endcsname#1{#3}}%
  \sym@global\let#1#1\relax
}
\DeclareRobustCommand\textchar{\text@char\textfont}
\DeclareRobustCommand\scriptchar{\text@char\scriptfont}%
```

Simplified the next bit because now the slot is read as one argument so no afterassignment and what have you. Just drop the char directly.

```
\def\text@char@sym#1#2#3#4{% #3=fam, #4=slot
  \begingroup
    \cs_set_eq:NN \@sym \prg_do_nothing: % defense against infinite loops
```

the next line will result in `\scriptfont`⟨*num*⟩, where `#3` provides the ⟨*num*⟩.

```
   \the\text@script@char#3%
   \char"#4\endgroup
}
\edef\tmp{\catcode\z@=\the\catcode\z@}
\catcode\z@=\active
\def\text@char#1#2{\begingroup
  \check@mathfonts
  \cs_set_eq:NN \text@script@char #1
```

```
  \cs_set_eq:NN \@sym \text@char@sym
  \cs_set_eq:NN \@symtype \use_ii:nn
  \cs_set_eq:NN \OrdSymbol \use:n
  \cs_set_eq:NN \ifmmode \iftrue
  \everymath{$\use_none:n}%$
  \def\mkern{\muskip\z@}
  \cs_set_eq:NN\mskip\mkern
  \ifcat\relax\noexpand#2% true if #2 is a cs.
    #2%
  \else
    \lccode\z@=\expandafter`\string#2\relax
    \lowercase{^^@}%
  \fi
  \endgroup
}
\tmp % restore catcode
\providecommand\textprime{}
\DeclareRobustCommand\textprime{\leavevmode
  \raise.8ex\hbox{\text@char\scriptfont\prime}%
}
\@ifundefined{resetMathstrut@}{}{%
  \def\resetMathstrut@{%
    \setbox\z@\hbox{\textchar\vert}%
    \ht\Mathstrutbox@\ht\z@ \dp\Mathstrutbox@\dp\z@
  }%
}
```

Arrow fills. changed to 7mu as in amsmath

```
\@ifundefined{rightarrowfill@}{}{%
  \def\rightarrowfill@#1{\m@th\setboxz@h{$#1\relbar$}\ht\z@\z@
    $#1\copy\z@\mkern-7mu\cleaders
    \hbox{$#1\mkern-2mu\box\z@\mkern-2mu$}\hfill
    \mkern-6mu\OrdSymbol{\rightarrow}$}
  \def\leftarrowfill@#1{\m@th\setboxz@h{$#1\relbar$}\ht\z@\z@
    $#1\OrdSymbol{\leftarrow}\mkern-6mu\cleaders
    \hbox{$#1\mkern-2mu\copy\z@\mkern-2mu$}\hfill
    \mkern-7mu\box\z@$}
  \def\leftrightarrowfill@#1{\m@th\setboxz@h{$#1\relbar$}\ht\z@\z@
    $#1\OrdSymbol{\leftarrow}\mkern-6mu\cleaders
    \hbox{$#1\mkern-2mu\box\z@\mkern-2mu$}\hfill
    \mkern-6mu\OrdSymbol{\rightarrow}$}
}
```

hey, this looks like a simple case switch...

```
\def\binrel@sym#1#2#3#4{%
  \xdef\binrel@@##1{%
    \ifx\math_sym_Ord:Nn #2 \math_csym_Ord:Nn
    \else\ifx\math_sym_Var:Nn#2 \math_csym_Var:Nn
    \else\ifx\math_sym_COs:Nn#2 \math_csym_COs:Nn
    \else\ifx\math_sym_COi:Nn#2 \math_csym_COi:Nn
    \else\ifx\math_sym_Bin:Nn#2 \math_csym_Bin:Nn
```

```
    \else\ifx\math_sym_Rel:Nn#2 \math_csym_Rel:Nn
    \else\ifx\math_sym_Pun:Nn#2 \math_csym_Pun:Nn
    \else\exp_not:N\@symErr \fi\fi\fi\fi\fi\fi\fi
  ?{\exp_not:N\OrdSymbol{##1}}}%
}

\def\binrel@a{%
  \def\math_sym_Ord:Nn##1##2{\gdef\binrel@@####1{\math_sym_Ord:Nn##1{\OrdSymbol{####1}}}}%
  \def\math_sym_Var:Nn##1##2{\gdef\binrel@@####1{\math_sym_Var:Nn##1{\OrdSymbol{####1}}}}%
  \def\math_sym_COs:Nn##1##2{\gdef\binrel@@####1{\math_sym_COs:Nn##1{\OrdSymbol{####1}}}}%
  \def\math_sym_COi:Nn##1##2{\gdef\binrel@@####1{\math_sym_COi:Nn##1{\OrdSymbol{####1}}}}%
  \def\math_sym_Bin:Nn##1##2{\gdef\binrel@@####1{\math_sym_Bin:Nn##1{\OrdSymbol{####1}}}}%
  \def\math_sym_Rel:Nn##1##2{\gdef\binrel@@####1{\math_sym_Rel:Nn##1{\OrdSymbol{####1}}}}%
  \def\math_sym_Pun:Nn##1##2{\gdef\binrel@@####1{\math_sym_Pun:Nn##1{\OrdSymbol{####1}}}}%
}
\def\binrel@#1{%
  \setbox\z@\hbox{$%
    \let\mathchoice\@gobblethree
    \let\@sym\binrel@sym \binrel@a
    #1$}%
}
\def\@symextension{sym}
\newcommand\usesymbols[1]{%
  \clist_map_variable:nNn{#1}\@tempb{%
    \exp_args:No\@onefilewithoptions{\@tempb}[][]\@symextension
  }%
}
% Need to introduce \ProvidesExplFile somehow
\newcommand\ProvidesSymbols[1]{\ProvidesFile{#1.sym}}
\DeclareRobustCommand{\not}[1]{\math_csym_Rel:Nn\not{\OrdSymbol{\notRel#1}}}
\DeclareRobustCommand{\OrdSymbol}[1]{%
  \begingroup\mathchars@reset#1\endgroup
}
\def\mathchars@reset{\let\@sym\@sym@ord \let\@symtype\@symtype@ord
  \let\OrdSymbol\relax}
\def\@symtype@ord#1#{}% a strange sort of \@gobble
\def\@sym@ord#1#2{\exp_after:wN\@sym@ord@a\string#2\@nil}%
```

Read delimited argument here. We want to find first character of DeA, Bin, etc. and the control sequence checked agains is `\m@DeL`, `\m@Pun`, etc. The lccode trick makes the . into an @ with catcode 12. This is what results when the code is called with `\string`. Beware of this when we change internal names for math groups! If a Delimiter is found, insert it with class 0 but use the smallest version available. Otherwise just insert math char of class 0. The code here is not pretty and it indicates it should be tackled differently!

```
\begingroup
\lccode`\.=`\_ \lowercase{\endgroup
\def\@sym@ord@a#1.#2.}#3#4\@nil#5#6{%
  \if D#3
     %\math_ord_delim_aux:Nn #5{#6}
```

```
    \math_sd_del_aux:Nnn 0 #5{#6}% check if this works!
  \else
    \math_char:NNn 0 #5{#6}
  \fi
}
\cs_set:Nn \math_ord_delim_aux:Nn {
  \math_sd_aux:nn { \math_char:NNn 0 } {#1{#2}}
}
```

Before declaring any math characters active, we have to take care of a small problem with amsmath v2.x, if it is loaded before flexisym. `\std@minus` and `\std@equal` are defined as

```
\mathchardef\std@minus\mathcode`\-\relax
\mathchardef\std@equal\mathcode`\=\relax
```

in `amsmath.sty` and again `\AtBeginDocument`. The latter is because

> In case some alternative math fonts are loaded later. [`amsmath.dtx`]

The problem arises because flexisym sets the mathcode of all symbols to 32768 which is illegal for a `\mathchardef`.

We have to remove the assignments from the `\AtBeginDocument` hook as they will cause an error there.

```
\@ifpackageloaded{amsmath}{%
  \begingroup
```

Split the contents of `\@begindocumenthook` by reading what we search for as a delimited argument and ensure these two assignments do not take place. It is questionable if anything reasonable can be done to them. In the case of a package such as mathpazo which defines

```
\DeclareMathSymbol{=}{\mathrel}{upright}{"3D}
```

the `\Relbar` will look wrong if we don't use the correct symbol. The way to solve this is define additional `.sym` files which contain the definition of `\relbar` and `\Relbar` needed. We need those additional files anyway for things like `\joinord`.

```
  \long\def\next#1\mathchardef\std@minus\mathcode`\-\relax
                  \mathchardef\std@equal\mathcode`\=\relax#2\flexi@stop{%
    \toks@{#1#2}%
    \xdef\@begindocumenthook{\the\toks@}%
  }%
  \expandafter\next\@begindocumenthook\flexi@stop
  \endgroup
}{}
```

There is problem when using `\DeclareMathOperator` as the operators defined call a command `\newmcodes@` which relies on the mathcode of `-` being less than 32768. We delay the definition `\AtBeginDocument` in case amssymb hasn't been loaded yet.

```
\AtBeginDocument{%
\def\newmcodes@{%
  \mathcode `\'39\space
  \mathcode `\*42\space
  \mathcode `\."613A\space
  \ifnum\mathcode`\-=45\space
  \else
```

The extra check. Don't do anything if - is math active.

```
    \ifnum\mathcode`\-=32768\space
    \else
      \mathchardef \std@minus \mathcode `\-\relax
    \fi
  \fi
  \mathcode `\-45\space
  \mathcode `\/47\space
  \mathcode `\:"603A\space\relax
}%
}
```

And we then continue with the options.

```
\DeclareOption{mathstyleoff}{%
  \PassOptionsToPackage{noactivechars}{mathstyle}}
\DeclareOption{cmbase}{\usesymbols{cmbase}}
\DeclareOption{mathpazo}{\usesymbols{mathpazo}}
\DeclareOption{mathptmx}{\usesymbols{mathptmx}}
\ExecuteOptions{cmbase}
\ProcessOptions\relax
\renewcommand{\lnot}{\neg}
\renewcommand{\land}{\wedge}
\renewcommand{\lor}{\vee}
\renewcommand{\le}{\leq}
\renewcommand{\ge}{\geq}
\renewcommand{\ne}{\neq}
\renewcommand{\owns}{\ni}
\renewcommand{\gets}{\leftarrow}
\renewcommand{\to}{\rightarrow}
\renewcommand{\|}{\Vert}
\RequirePackage{mathstyle}
⟨/package⟩\endinput
```

2 cmbase, mathpazo, mathptmx

For each math font package we define a corresponding symbol file with extension `sym`. The Computer Modern base is called `cmbase` and `mathpazo` and `mathptmx` corresponds to the packages. The definitions are almost identical as they mostly concern the positions in the math font encodings. Look for differences in `\joinord`, `\relbar` and `\Relbar`. If you inspect the source code, you'll see that the support

for mathptmx didn't require any work but I thought it better to create a `sym` file to maintain a uniform interface.

> **Open question on `!` and `?`: maybe they should have type 'Pun' instead of 'DeR'. Need to search for uses in math in AMS archives. Or, maybe add a special 'Clo' type for them: non-extensible closing delimiter.**

Default mathgroup setup.

```
⟨*cmbase | mathpazo | mathptmx⟩
⟨cmbase⟩\ProvidesSymbols{cmbase}[2007/12/19 v0.92]
⟨mathpazo⟩\ProvidesSymbols{mathpazo}[2010/07/11 v0.3]
⟨mathptmx⟩\ProvidesSymbols{mathptmx}[2010/07/11 v0.3]
\ExplSyntaxOn
\cs_gset:cpx {mg@OT1}  {\hexnumber@\symoperators}
\cs_gset:cpx {mg@OML}  {\hexnumber@\symletters}
\cs_gset:cpx {mg@OMS}  {\hexnumber@\symsymbols}
\cs_gset:cpx {mg@OMX}  {\hexnumber@\symlargesymbols}
\cs_gset:Npx \mg@bin   {\mg@OMS}
\cs_gset:Npx \mg@del   {\mg@OMX}
\cs_gset:Npx \mg@digit {\exp_not:c{mg@OT1}}
\cs_gset:Npn \mg@latin {\mg@OML}
\cs_gset_eq:NN \mg@Latin \mg@latin
\cs_gset_eq:NN \mg@greek \mg@latin
⟨cmbase | mathptmx⟩\cs_gset_eq:NN\mg@Greek\mg@digit
```

Mathpazo takes the upper case greeks from the letter font if slantedGreek is in effect, but from *upright* if not. Mathptmx also takes the slanted greek from the letter font.

```
⟨mathpazo⟩\@ifpackagewith{mathpazo}{slantedGreek}{%
⟨mathpazo⟩   \cs_gset_eq:NN\mg@Greek\mg@latin
⟨mathpazo⟩}{%
⟨mathpazo⟩   \cs_gset:cpx{mg@Greek}{\hexnumber@\symupright}
⟨mathpazo⟩}
⟨mathptmx⟩\@ifpackagewith{mathptmx}{slantedGreek}{%
⟨mathptmx⟩    \cs_gset_eq:NN\mg@Greek\mg@latin
⟨mathptmx⟩}{}
\cs_gset_eq:NN \mg@rel \mg@bin
\cs_gset_eq:NN \mg@ord \mg@bin
\cs_gset_eq:NN \mg@cop \mg@del
```

Symbols from the 128-character `cmr` encoding. Paren and square bracket delimiters from this encoding are covered by the definitions in the `cmex` section, however.

```
\DeclareFlexSymbol{!}     {Pun}{OT1}{21}
\DeclareFlexSymbol{+}     {Bin}{OT1}{2B}
\DeclareFlexSymbol{:}     {Rel}{OT1}{3A}
\DeclareFlexSymbol{\colon}{Pun}{OT1}{3A}
\DeclareFlexSymbol{;}     {Pun}{OT1}{3B}
\DeclareFlexSymbol{=}     {Rel}{OT1}{3D}
```

```
\DeclareFlexSymbol{?}      {Pun}{OT1}{3F}
```

$\mathcal{AMS}$TEX, and therefore the amsmath package, make the uppercase Greek letters class 0 (nonvariable) instead of 7 (variable), to eliminate the glaring inconsistency with lowercase Greek. (In plain TEX, `{\bf\Delta}` works, while `{\bf\delta}` doesn't.) Let us try to make them both variable (fonts permitting) instead of nonvariable.

```
\DeclareFlexSymbol{\Gamma}  {Var}{Greek}{00}
\DeclareFlexSymbol{\Delta}  {Var}{Greek}{01}
\DeclareFlexSymbol{\Theta}  {Var}{Greek}{02}
\DeclareFlexSymbol{\Lambda} {Var}{Greek}{03}
\DeclareFlexSymbol{\Xi}     {Var}{Greek}{04}
\DeclareFlexSymbol{\Pi}     {Var}{Greek}{05}
\DeclareFlexSymbol{\Sigma}  {Var}{Greek}{06}
\DeclareFlexSymbol{\Upsilon}{Var}{Greek}{07}
\DeclareFlexSymbol{\Phi}    {Var}{Greek}{08}
\DeclareFlexSymbol{\Psi}    {Var}{Greek}{09}
\DeclareFlexSymbol{\Omega}  {Var}{Greek}{0A}
```

Decimal digits.

```
\DeclareFlexSymbol{0}{Var}{digit}{30}
\DeclareFlexSymbol{1}{Var}{digit}{31}
\DeclareFlexSymbol{2}{Var}{digit}{32}
\DeclareFlexSymbol{3}{Var}{digit}{33}
\DeclareFlexSymbol{4}{Var}{digit}{34}
\DeclareFlexSymbol{5}{Var}{digit}{35}
\DeclareFlexSymbol{6}{Var}{digit}{36}
\DeclareFlexSymbol{7}{Var}{digit}{37}
\DeclareFlexSymbol{8}{Var}{digit}{38}
\DeclareFlexSymbol{9}{Var}{digit}{39}
```

Symbols from the 128-character `cmmi` encoding.

```
\DeclareFlexSymbol{,}{Pun}{OML}{3B}
\DeclareFlexSymbol{.}{Ord}{OML}{3A}
\DeclareFlexSymbol{/}{Ord}{OML}{3D}
\DeclareFlexSymbol{<}{Rel}{OML}{3C}
\DeclareFlexSymbol{>}{Rel}{OML}{3E}
```

To do: make the Var property of lc Greek work properly.

```
\DeclareFlexSymbol{\alpha}     {Var}{greek}{0B}
\DeclareFlexSymbol{\beta}      {Var}{greek}{0C}
\DeclareFlexSymbol{\gamma}     {Var}{greek}{0D}
\DeclareFlexSymbol{\delta}     {Var}{greek}{0E}
\DeclareFlexSymbol{\epsilon}   {Var}{greek}{0F}
\DeclareFlexSymbol{\zeta}      {Var}{greek}{10}
\DeclareFlexSymbol{\eta}       {Var}{greek}{11}
\DeclareFlexSymbol{\theta}     {Var}{greek}{12}
\DeclareFlexSymbol{\iota}      {Var}{greek}{13}
\DeclareFlexSymbol{\kappa}     {Var}{greek}{14}
\DeclareFlexSymbol{\lambda}    {Var}{greek}{15}
\DeclareFlexSymbol{\mu}        {Var}{greek}{16}
```

```
\DeclareFlexSymbol{\nu}         {Var}{greek}{17}
\DeclareFlexSymbol{\xi}         {Var}{greek}{18}
\DeclareFlexSymbol{\pi}         {Var}{greek}{19}
\DeclareFlexSymbol{\rho}        {Var}{greek}{1A}
\DeclareFlexSymbol{\sigma}      {Var}{greek}{1B}
\DeclareFlexSymbol{\tau}        {Var}{greek}{1C}
\DeclareFlexSymbol{\upsilon}    {Var}{greek}{1D}
\DeclareFlexSymbol{\phi}        {Var}{greek}{1E}
\DeclareFlexSymbol{\chi}        {Var}{greek}{1F}
\DeclareFlexSymbol{\psi}        {Var}{greek}{20}
\DeclareFlexSymbol{\omega}      {Var}{greek}{21}
\DeclareFlexSymbol{\varepsilon}{Var}{greek}{22}
\DeclareFlexSymbol{\vartheta}   {Var}{greek}{23}
\DeclareFlexSymbol{\varpi}      {Var}{greek}{24}
\DeclareFlexSymbol{\varrho}     {Var}{greek}{25}
\DeclareFlexSymbol{\varsigma}   {Var}{greek}{26}
\DeclareFlexSymbol{\varphi}     {Var}{greek}{27}
```

Note that in plain TEX `\imath` and `\jmath` are not variable-font. But if a `j` changes font to, let's say, sans serif or calligraphic, a dotless `j` in the same context should change font in the same way.

```
\DeclareFlexSymbol{\imath}            {Var}{OML}{7B}
\DeclareFlexSymbol{\jmath}            {Var}{OML}{7C}
\DeclareFlexSymbol{\ell}              {Ord}{OML}{60}
\DeclareFlexSymbol{\wp}               {Ord}{OML}{7D}
\DeclareFlexSymbol{\partial}          {Ord}{OML}{40}
\DeclareFlexSymbol{\flat}             {Ord}{OML}{5B}
\DeclareFlexSymbol{\natural}          {Ord}{OML}{5C}
\DeclareFlexSymbol{\sharp}            {Ord}{OML}{5D}
\DeclareFlexSymbol{\triangleleft}     {Bin}{OML}{2F}
\DeclareFlexSymbol{\triangleright}    {Bin}{OML}{2E}
\DeclareFlexSymbol{\star}             {Bin}{OML}{3F}
\DeclareFlexSymbol{\smile}            {Rel}{OML}{5E}
\DeclareFlexSymbol{\frown}            {Rel}{OML}{5F}
\DeclareFlexSymbol{\leftharpoonup}    {Rel}{OML}{28}
\DeclareFlexSymbol{\leftharpoondown}  {Rel}{OML}{29}
\DeclareFlexSymbol{\rightharpoonup}   {Rel}{OML}{2A}
\DeclareFlexSymbol{\rightharpoondown}{Rel}{OML}{2B}
```

Latin

```
\DeclareFlexSymbol{a}{Var}{latin}{61}
\DeclareFlexSymbol{b}{Var}{latin}{62}
\DeclareFlexSymbol{c}{Var}{latin}{63}
\DeclareFlexSymbol{d}{Var}{latin}{64}
\DeclareFlexSymbol{e}{Var}{latin}{65}
\DeclareFlexSymbol{f}{Var}{latin}{66}
\DeclareFlexSymbol{g}{Var}{latin}{67}
\DeclareFlexSymbol{h}{Var}{latin}{68}
\DeclareFlexSymbol{i}{Var}{latin}{69}
\DeclareFlexSymbol{j}{Var}{latin}{6A}
```

```
\DeclareFlexSymbol{k}{Var}{latin}{6B}
\DeclareFlexSymbol{l}{Var}{latin}{6C}
\DeclareFlexSymbol{m}{Var}{latin}{6D}
\DeclareFlexSymbol{n}{Var}{latin}{6E}
\DeclareFlexSymbol{o}{Var}{latin}{6F}
\DeclareFlexSymbol{p}{Var}{latin}{70}
\DeclareFlexSymbol{q}{Var}{latin}{71}
\DeclareFlexSymbol{r}{Var}{latin}{72}
\DeclareFlexSymbol{s}{Var}{latin}{73}
\DeclareFlexSymbol{t}{Var}{latin}{74}
\DeclareFlexSymbol{u}{Var}{latin}{75}
\DeclareFlexSymbol{v}{Var}{latin}{76}
\DeclareFlexSymbol{w}{Var}{latin}{77}
\DeclareFlexSymbol{x}{Var}{latin}{78}
\DeclareFlexSymbol{y}{Var}{latin}{79}
\DeclareFlexSymbol{z}{Var}{latin}{7A}
\DeclareFlexSymbol{A}{Var}{Latin}{41}
\DeclareFlexSymbol{B}{Var}{Latin}{42}
\DeclareFlexSymbol{C}{Var}{Latin}{43}
\DeclareFlexSymbol{D}{Var}{Latin}{44}
\DeclareFlexSymbol{E}{Var}{Latin}{45}
\DeclareFlexSymbol{F}{Var}{Latin}{46}
\DeclareFlexSymbol{G}{Var}{Latin}{47}
\DeclareFlexSymbol{H}{Var}{Latin}{48}
\DeclareFlexSymbol{I}{Var}{Latin}{49}
\DeclareFlexSymbol{J}{Var}{Latin}{4A}
\DeclareFlexSymbol{K}{Var}{Latin}{4B}
\DeclareFlexSymbol{L}{Var}{Latin}{4C}
\DeclareFlexSymbol{M}{Var}{Latin}{4D}
\DeclareFlexSymbol{N}{Var}{Latin}{4E}
\DeclareFlexSymbol{O}{Var}{Latin}{4F}
\DeclareFlexSymbol{P}{Var}{Latin}{50}
\DeclareFlexSymbol{Q}{Var}{Latin}{51}
\DeclareFlexSymbol{R}{Var}{Latin}{52}
\DeclareFlexSymbol{S}{Var}{Latin}{53}
\DeclareFlexSymbol{T}{Var}{Latin}{54}
\DeclareFlexSymbol{U}{Var}{Latin}{55}
\DeclareFlexSymbol{V}{Var}{Latin}{56}
\DeclareFlexSymbol{W}{Var}{Latin}{57}
\DeclareFlexSymbol{X}{Var}{Latin}{58}
\DeclareFlexSymbol{Y}{Var}{Latin}{59}
\DeclareFlexSymbol{Z}{Var}{Latin}{5A}
```

The `\ldotPun` glyph is used in constructing the `\ldots` symbol. It is just a period with a different math symbol class. `\lhookRel` and `\rhookRel` are used in a similar way for building hooked arrow symbols.

```
\DeclareFlexSymbol{\ldotPun}{Pun}{OML}{3A}
\def\ldotp{\ldotPun}
\DeclareFlexSymbol{\lhookRel}{Rel}{OML}{2C}
\DeclareFlexSymbol{\rhookRel}{Rel}{OML}{2D}
```

Symbols from the 128-character `cmsy` encoding.

```
\DeclareFlexSymbol{*}           {Bin}{bin}{03} % \ast
\DeclareFlexSymbol{-}           {Bin}{bin}{00}
\DeclareFlexSymbol{|}           {Ord}{OMS}{6A}
\DeclareFlexSymbol{\aleph}      {Ord}{ord}{40}
\DeclareFlexSymbol{\Re}         {Ord}{ord}{3C}
\DeclareFlexSymbol{\Im}         {Ord}{ord}{3D}
\DeclareFlexSymbol{\infty}      {Ord}{ord}{31}
\DeclareFlexSymbol{\prime}      {Ord}{ord}{30}
\DeclareFlexSymbol{\emptyset}   {Ord}{ord}{3B}
\DeclareFlexSymbol{\nabla}      {Ord}{ord}{72}
\DeclareFlexSymbol{\top}        {Ord}{ord}{3E}
\DeclareFlexSymbol{\bot}        {Ord}{ord}{3F}
\DeclareFlexSymbol{\triangle}   {Ord}{ord}{34}
\DeclareFlexSymbol{\forall}     {Ord}{ord}{38}
\DeclareFlexSymbol{\exists}     {Ord}{ord}{39}
\DeclareFlexSymbol{\neg}        {Ord}{ord}{3A}
\DeclareFlexSymbol{\clubsuit}   {Ord}{ord}{7C}
\DeclareFlexSymbol{\diamondsuit}{Ord}{ord}{7D}
\DeclareFlexSymbol{\heartsuit}  {Ord}{ord}{7E}
\DeclareFlexSymbol{\spadesuit}  {Ord}{ord}{7F}
\DeclareFlexSymbol{\smallint}   {COs}{OMS}{73}
```

Binary operators.

```
\DeclareFlexSymbol{\bigtriangleup}  {Bin}{bin}{34}
\DeclareFlexSymbol{\bigtriangledown}{Bin}{bin}{35}
\DeclareFlexSymbol{\wedge}          {Bin}{bin}{5E}
\DeclareFlexSymbol{\vee}            {Bin}{bin}{5F}
\DeclareFlexSymbol{\cap}            {Bin}{bin}{5C}
\DeclareFlexSymbol{\cup}            {Bin}{bin}{5B}
\DeclareFlexSymbol{\ddagger}        {Bin}{bin}{7A}
\DeclareFlexSymbol{\dagger}         {Bin}{bin}{79}
\DeclareFlexSymbol{\sqcap}          {Bin}{bin}{75}
\DeclareFlexSymbol{\sqcup}          {Bin}{bin}{74}
\DeclareFlexSymbol{\uplus}          {Bin}{bin}{5D}
\DeclareFlexSymbol{\amalg}          {Bin}{bin}{71}
\DeclareFlexSymbol{\diamond}        {Bin}{bin}{05}
\DeclareFlexSymbol{\bullet}         {Bin}{bin}{0F}
\DeclareFlexSymbol{\wr}             {Bin}{bin}{6F}
\DeclareFlexSymbol{\div}            {Bin}{bin}{04}
\DeclareFlexSymbol{\odot}           {Bin}{bin}{0C}
\DeclareFlexSymbol{\oslash}         {Bin}{bin}{0B}
\DeclareFlexSymbol{\otimes}         {Bin}{bin}{0A}
\DeclareFlexSymbol{\ominus}         {Bin}{bin}{09}
\DeclareFlexSymbol{\oplus}          {Bin}{bin}{08}
\DeclareFlexSymbol{\mp}             {Bin}{bin}{07}
\DeclareFlexSymbol{\pm}             {Bin}{bin}{06}
\DeclareFlexSymbol{\circ}           {Bin}{bin}{0E}
\DeclareFlexSymbol{\bigcirc}        {Bin}{bin}{0D}
\DeclareFlexSymbol{\setminus}       {Bin}{bin}{6E}
```

```
\DeclareFlexSymbol{\cdot}           {Bin}{bin}{01}
\DeclareFlexSymbol{\ast}            {Bin}{bin}{03}
\DeclareFlexSymbol{\times}          {Bin}{bin}{02}
```

Relation symbols.

```
\DeclareFlexSymbol{\propto}        {Rel}{rel}{2F}
\DeclareFlexSymbol{\sqsubseteq}    {Rel}{rel}{76}
\DeclareFlexSymbol{\sqsupseteq}    {Rel}{rel}{77}
\DeclareFlexSymbol{\parallel}      {Rel}{rel}{6B}
\DeclareFlexSymbol{\mid}           {Rel}{rel}{6A}
\DeclareFlexSymbol{\dashv}         {Rel}{rel}{61}
\DeclareFlexSymbol{\vdash}         {Rel}{rel}{60}
\DeclareFlexSymbol{\nearrow}       {Rel}{rel}{25}
\DeclareFlexSymbol{\searrow}       {Rel}{rel}{26}
\DeclareFlexSymbol{\nwarrow}       {Rel}{rel}{2D}
\DeclareFlexSymbol{\swarrow}       {Rel}{rel}{2E}
\DeclareFlexSymbol{\Leftrightarrow}{Rel}{rel}{2C}
\DeclareFlexSymbol{\Leftarrow}     {Rel}{rel}{28}
\DeclareFlexSymbol{\Rightarrow}    {Rel}{rel}{29}
\DeclareFlexSymbol{\leq}           {Rel}{rel}{14}
\DeclareFlexSymbol{\geq}           {Rel}{rel}{15}
\DeclareFlexSymbol{\succ}          {Rel}{rel}{1F}
\DeclareFlexSymbol{\prec}          {Rel}{rel}{1E}
\DeclareFlexSymbol{\approx}        {Rel}{rel}{19}
\DeclareFlexSymbol{\succeq}        {Rel}{rel}{17}
\DeclareFlexSymbol{\preceq}        {Rel}{rel}{16}
\DeclareFlexSymbol{\supset}        {Rel}{rel}{1B}
\DeclareFlexSymbol{\subset}        {Rel}{rel}{1A}
\DeclareFlexSymbol{\supseteq}      {Rel}{rel}{13}
\DeclareFlexSymbol{\subseteq}      {Rel}{rel}{12}
\DeclareFlexSymbol{\in}            {Rel}{rel}{32}
\DeclareFlexSymbol{\ni}            {Rel}{rel}{33}
\DeclareFlexSymbol{\gg}            {Rel}{rel}{1D}
\DeclareFlexSymbol{\ll}            {Rel}{rel}{1C}
\DeclareFlexSymbol{\leftrightarrow}{Rel}{rel}{24}
\DeclareFlexSymbol{\leftarrow}     {Rel}{rel}{20}
\DeclareFlexSymbol{\rightarrow}    {Rel}{rel}{21}
\DeclareFlexSymbol{\sim}           {Rel}{rel}{18}
\DeclareFlexSymbol{\simeq}         {Rel}{rel}{27}
\DeclareFlexSymbol{\perp}          {Rel}{rel}{3F}
\DeclareFlexSymbol{\equiv}         {Rel}{rel}{11}
\DeclareFlexSymbol{\asymp}         {Rel}{rel}{10}
```

The `\notRel` glyph is a special zero-width glyph intended only for use in constructing negated symbols. `\mapstoRel` and `\cdotPun` have similar but more restricted applications.

```
\DeclareFlexSymbol{\notRel}   {Rel}{rel}{36}
\DeclareFlexSymbol{\mapstoOrd}{Ord}{OMS}{37}
\DeclareFlexSymbol{\cdotOrd}  {Ord}{OMS}{01}
\cs_set:Npn\cdotp{\mathpunct{\cdotOrd}}
```

Symbols from the 128-character `cmex` encoding. `COs` stands for 'cumulative operator (sum-like)'. `COi` stands for 'cumulative operator (integral-like)'. These typically differ only in the default placement of limits. `cop` stands for 'cumulative operator math group'.

```
\DeclareFlexSymbol{\coprod}   {COs}{cop}{60}
\DeclareFlexSymbol{\bigvee}   {COs}{cop}{57}
\DeclareFlexSymbol{\bigwedge} {COs}{cop}{56}
\DeclareFlexSymbol{\biguplus} {COs}{cop}{55}
\DeclareFlexSymbol{\bigcap}   {COs}{cop}{54}
\DeclareFlexSymbol{\bigcup}   {COs}{cop}{53}
\DeclareFlexSymbol{\int}      {COi}{cop}{52}
\DeclareFlexSymbol{\prod}     {COs}{cop}{51}
\DeclareFlexSymbol{\sum}      {COs}{cop}{50}
\DeclareFlexSymbol{\bigotimes}{COs}{cop}{4E}
\DeclareFlexSymbol{\bigoplus} {COs}{cop}{4C}
\DeclareFlexSymbol{\bigodot}  {COs}{cop}{4A}
\DeclareFlexSymbol{\oint}     {COi}{cop}{48}
\DeclareFlexSymbol{\bigsqcup} {COs}{cop}{46}
```

Delimiter symbols. `DeL` stands for 'delimiter (left)'. `DeR` stands for 'delimiter (right)'. `DeB` stands for 'delimiter (bidirectional)'. The principal encoding point for an extensible delimiter is the first link in the list of linked sizes as specified in the font metric information. For a math encoding such as OT1/OML/OMS/OMX where not all sizes of a given delimiter reside in a given font, the extra encoding point for the smallest delimiter must be supplied by defining

```
\sd@GXX
```

where G is the mathgroup and XX is the hexadecimal glyph position. `\DeclareFlexDelimiter` does that for us.

```
\DeclareFlexDelimiter{\rangle}{DeR}{del}{0B}{OMS}{69}
\DeclareFlexDelimiter{\langle}{DeL}{del}{0A}{OMS}{68}
\DeclareFlexDelimiter{\rbrace}{DeR}{del}{09}{OMS}{67}
\DeclareFlexDelimiter{\lbrace}{DeL}{del}{08}{OMS}{66}
\DeclareFlexDelimiter{\rceil} {DeR}{del}{07}{OMS}{65}
\DeclareFlexDelimiter{\lceil} {DeL}{del}{06}{OMS}{64}
\DeclareFlexDelimiter{\rfloor}{DeR}{del}{05}{OMS}{63}
\DeclareFlexDelimiter{\lfloor}{DeL}{del}{04}{OMS}{62}
\DeclareFlexDelimiter{(}      {DeL}{del}{00}{OT1}{28}
\DeclareFlexDelimiter{)}      {DeR}{del}{01}{OT1}{29}
\DeclareFlexDelimiter{[}      {DeL}{del}{02}{OT1}{5B}
\DeclareFlexDelimiter{]}      {DeR}{del}{03}{OT1}{5D}
\DeclareFlexDelimiter{\lVert} {DeL}{del}{0D}{OMS}{6B}
\DeclareFlexDelimiter{\rVert} {DeR}{del}{0D}{OMS}{6B}
\DeclareFlexDelimiter{\lvert} {DeL}{del}{0C}{OMS}{6A}
\DeclareFlexDelimiter{\rvert} {DeR}{del}{0C}{OMS}{6A}
\DeclareFlexDelimiter{\Vert}  {DeB}{del}{0D}{OMS}{6B}
\DeclareFlexDelimiter{\vert}  {DeB}{del}{0C}{OMS}{6A}
```

Maybe make the vert bars mathord instead of delimiter, to discourage poor usage.

```
\DeclareFlexDelimiter{|}{DeB}{del}{0C}{OMS}{6A}
\DeclareFlexDelimiter{/}{DeB}{del}{0E}{OML}{3D}
```

These wacky delimiters need to be supported I guess for compabitility reasons. The DeA delimiter type is a special case used only for these arrows.

```
\DeclareFlexDelimiter{\lmoustache} {DeL}{del}{40}{del}{7A}
\DeclareFlexDelimiter{\rmoustache} {DeR}{del}{41}{del}{7B}
\DeclareFlexDelimiter{\lgroup}     {DeL}{del}{3A}{del}{3A}
\DeclareFlexDelimiter{\rgroup}     {DeR}{del}{3B}{del}{3B}
\DeclareFlexDelimiter{\bracevert}  {DeB}{del}{3E}{del}{3E}
\DeclareFlexDelimiter{\arrowvert}  {DeB}{del}{3C}{OMS}{6A}
\DeclareFlexDelimiter{\Arrowvert}  {DeB}{del}{3D}{OMS}{6B}
\DeclareFlexDelimiter{\uparrow}    {DeA}{del}{78}{OMS}{22}
\DeclareFlexDelimiter{\downarrow}  {DeA}{del}{79}{OMS}{23}
\DeclareFlexDelimiter{\updownarrow}{DeA}{del}{3F}{OMS}{6C}
\DeclareFlexDelimiter{\Uparrow}    {DeA}{del}{7E}{OMS}{2A}
\DeclareFlexDelimiter{\Downarrow}  {DeA}{del}{7F}{OMS}{2B}
\DeclareFlexDelimiter{\Updownarrow}{DeA}{del}{77}{OMS}{6D}
\DeclareFlexDelimiter{\backslash}  {DeB}{del}{0F}{OMS}{6E}
```

3 Some compound symbols

The following symbols are not robust in standard LaTeX because they use `#` or `\mathpalette` (which is not robust and contains a `#` in its expansion): `\angle`, `\cong`, `\notin`, `\rightleftharpoons`.

In this definition of `\hbar`, the symbol is cobbled together from a math italic h and the cmr overbar accent glyph.

```
\DeclareFlexSymbol{\hbarOrd}{Ord}{OT1}{16}
\DeclareFlexCompoundSymbol{\hbar}{Ord}{\hbarOrd\mkern-9mu h}
```

For `\surd`, the interior symbol gets math class 1 (cumulative operator) to make the glyph vertically centered on the math axis, but the desired horizontal spacing is the spacing for a mathord. (Couldn't it just be class mathopen, though?)

```
\DeclareFlexSymbol{\surdOrd}{Ord}{OMS}{70}
\DeclareFlexCompoundSymbol{\surd}{Ord}{\mathop{\surdOrd}}
```

As shown in this definition of `\angle`, rule dimens are not allowed to use math-units, unfortunately.

```
\DeclareFlexCompoundSymbol{\angle}{Ord}{%
  \vbox{\ialign{%
      $\m@th\scriptstyle##$\crcr
      \notRel\mathrel{\mkern14mu}\crcr
      \noalign{\nointerlineskip}%
      \mkern2.5mu\leaders\hrule \@height.34pt\hfill\mkern2.5mu\crcr
  }}%
}
```

The \not function, which is defined in the flexisym package, requires a suitably defined \notRel symbol.

```
\DeclareFlexCompoundSymbol{\neq}{Rel}{\not{=}}
```

.

```
\DeclareFlexCompoundSymbol{\mapsto}{Rel}{\mapstoOrd\rightarrow}
```

The \@vereq function ends by centering the whole construction on the math axis, unlike \buildrel where the base symbol remains at its normal altitude. Furthermore, \@vereq leaves the math style of the top symbol as given instead of downsizing to scriptstyle.

```
\DeclareFlexCompoundSymbol{\cong}{Rel}{\mathpalette\@vereq\sim}
```

The \m@th in the fontmath.ltx definition of \notin is superfluous unless \c@ncel doesn't include it (which was perhaps true in an older version of plain.tex?).

```
\providecommand*\joinord{}
⟨cmbase | mathptmx⟩\renewcommand*\joinord{\mkern-3mu }
⟨mathpazo⟩\renewcommand*\joinord{\mkern-3.45mu }
\DeclareFlexCompoundSymbol{\notin}{Rel}{\mathpalette\c@ncel\in}
\DeclareFlexCompoundSymbol{\rightleftharpoons}{Rel}{\mathpalette\rlh@{}}
\DeclareFlexCompoundSymbol{\doteq}{Rel}{\buildrel\textstyle.\over=}
\DeclareFlexCompoundSymbol{\hookrightarrow}{Rel}{\lhookRel\joinord\rightarrow}
\DeclareFlexCompoundSymbol{\hookleftarrow}{Rel}{\leftarrow\joinord\rhookRel}
\DeclareFlexCompoundSymbol{\bowtie}{Rel}{\triangleright\joinord\triangleleft}
\DeclareFlexCompoundSymbol{\models}{Rel}{\vert\joinord=}
\DeclareFlexCompoundSymbol{\Longrightarrow}{Rel}{\Relbar\joinord\Rightarrow}
\DeclareFlexCompoundSymbol{\longrightarrow}{Rel}{\relbar\joinord\rightarrow}
\DeclareFlexCompoundSymbol{\Longleftarrow}{Rel}{\Leftarrow\joinord\Relbar}
\DeclareFlexCompoundSymbol{\longleftarrow}{Rel}{\leftarrow\joinord\relbar}
\DeclareFlexCompoundSymbol{\longmapsto}{Rel}{\mapstochar\longrightarrow}
\DeclareFlexCompoundSymbol{\longleftrightarrow}{Rel}{\leftarrow\joinord\rightarrow}
\DeclareFlexCompoundSymbol{\Longleftrightarrow}{Rel}{\Leftarrow\joinord\Rightarrow}
```

Here is what you get from the old definition of \iff.

```
\glue 2.77771 plus 2.77771
\glue(\thickmuskip) 2.77771 plus 2.77771
\OMS/cmsy/m/n/10 (
\hbox(0.0+0.0)x-1.66663
.\kern -1.66663
\OMS/cmsy/m/n/10 )
\penalty 500
\glue 2.77771 plus 2.77771
\glue(\thickmuskip) 2.77771 plus 2.77771
```

Looks like it could be simplified slightly. But it's not so easy as it looks to do it without screwing up the line breaking possibilities.

```
\renewcommand*\iff{%
  \mskip\thickmuskip\Longleftrightarrow\mskip\thickmuskip
}
```

Some dotly symbols.

```
\DeclareFlexCompoundSymbol{\cdots}{Inn}{\cdotp\cdotp\cdotp}%
\DeclareFlexCompoundSymbol{\vdots}{Ord}{%
  \vbox{\baselineskip4\p@ \lineskiplimit\z@
    \kern6\p@\hbox{.}\hbox{.}\hbox{.}}}
\DeclareFlexCompoundSymbol{\ddots}{Inn}{%
  \mkern1mu\raise7\p@
  \vbox{\kern7\p@\hbox{.}}\mkern2mu%
  \raise4\p@\hbox{.}\mkern2mu\raise\p@\hbox{.}\mkern1mu%
}
```

.

```
\def\relbar{\begingroup \def\smash@{tb}% in case amsmath is loaded
    \mathpalette\mathsm@sh{\mathchar"200 }\endgroup}
```

For `\Relbar` we take an equal sign of class 0 (Ord) from the operator family. For cmr and mathptmx we know this is family 0.

```
⟨cmbase | mathptmx⟩\def\Relbar{\mathchar"3D }
```

For the mathpazo setup we need to use the equal sign from cmr and so must insert class 0 and use the symbol from the upright symbols.

```
⟨mathpazo⟩\edef\Relbar{\mathchar\string"\hexnumber@\symupright3D }
```

Done.

```
\ExplSyntaxOff
⟨/cmbase | mathpazo | mathptmx⟩
```

Various synonyms such as `\le` for `\leq` and `\to` for `\rightarrow` are defined in flexisym with `\def` instead of `\let`, for slower execution speed but smaller chance of synchronization problems.

```
⟨*msabm⟩
\ProvidesSymbols{msabm}[2001/09/08 v0.91]
\ExplSyntaxOn

\RequirePackage{amsfonts}\relax

\cs_gset:cpx{mg@MSA}{\hexnumber@\symAMSa}%
\cs_gset:cpx{mg@MSB}{\hexnumber@\symAMSb}%

\DeclareFlexSymbol{\boxdot}              {Bin}{MSA}{00}
\DeclareFlexSymbol{\boxplus}             {Bin}{MSA}{01}
\DeclareFlexSymbol{\boxtimes}            {Bin}{MSA}{02}
\DeclareFlexSymbol{\square}              {Ord}{MSA}{03}
\DeclareFlexSymbol{\blacksquare}         {Ord}{MSA}{04}
\DeclareFlexSymbol{\centerdot}           {Bin}{MSA}{05}
\DeclareFlexSymbol{\lozenge}             {Ord}{MSA}{06}
\DeclareFlexSymbol{\blacklozenge}        {Ord}{MSA}{07}
\DeclareFlexSymbol{\circlearrowright}    {Rel}{MSA}{08}
\DeclareFlexSymbol{\circlearrowleft}     {Rel}{MSA}{09}
```

In amsfonts.sty:

```
%%\DeclareFlexSymbol{\rightleftharpoons}{Rel}{MSA}{0A}
\DeclareFlexSymbol{\leftrightharpoons}  {Rel}{MSA}{0B}
```

```
\DeclareFlexSymbol{\boxminus}           {Bin}{MSA}{0C}
\DeclareFlexSymbol{\Vdash}              {Rel}{MSA}{0D}
\DeclareFlexSymbol{\Vvdash}             {Rel}{MSA}{0E}
\DeclareFlexSymbol{\vDash}              {Rel}{MSA}{0F}
\DeclareFlexSymbol{\twoheadrightarrow}  {Rel}{MSA}{10}
\DeclareFlexSymbol{\twoheadleftarrow}   {Rel}{MSA}{11}
\DeclareFlexSymbol{\leftleftarrows}     {Rel}{MSA}{12}
\DeclareFlexSymbol{\rightrightarrows}   {Rel}{MSA}{13}
\DeclareFlexSymbol{\upuparrows}         {Rel}{MSA}{14}
\DeclareFlexSymbol{\downdownarrows}     {Rel}{MSA}{15}
\DeclareFlexSymbol{\upharpoonright}     {Rel}{MSA}{16}
 \let\restriction\upharpoonright
\DeclareFlexSymbol{\downharpoonright}   {Rel}{MSA}{17}
\DeclareFlexSymbol{\upharpoonleft}      {Rel}{MSA}{18}
\DeclareFlexSymbol{\downharpoonleft}    {Rel}{MSA}{19}
\DeclareFlexSymbol{\rightarrowtail}     {Rel}{MSA}{1A}
\DeclareFlexSymbol{\leftarrowtail}      {Rel}{MSA}{1B}
\DeclareFlexSymbol{\leftrightarrows}    {Rel}{MSA}{1C}
\DeclareFlexSymbol{\rightleftarrows}    {Rel}{MSA}{1D}
\DeclareFlexSymbol{\Lsh}                {Rel}{MSA}{1E}
\DeclareFlexSymbol{\Rsh}                {Rel}{MSA}{1F}
\DeclareFlexSymbol{\rightsquigarrow}    {Rel}{MSA}{20}
\DeclareFlexSymbol{\leftrightsquigarrow}{Rel}{MSA}{21}
\DeclareFlexSymbol{\looparrowleft}      {Rel}{MSA}{22}
\DeclareFlexSymbol{\looparrowright}     {Rel}{MSA}{23}
\DeclareFlexSymbol{\circeq}             {Rel}{MSA}{24}
\DeclareFlexSymbol{\succsim}            {Rel}{MSA}{25}
\DeclareFlexSymbol{\gtrsim}             {Rel}{MSA}{26}
\DeclareFlexSymbol{\gtrapprox}          {Rel}{MSA}{27}
\DeclareFlexSymbol{\multimap}           {Rel}{MSA}{28}
\DeclareFlexSymbol{\therefore}          {Rel}{MSA}{29}
\DeclareFlexSymbol{\because}            {Rel}{MSA}{2A}
\DeclareFlexSymbol{\doteqdot}           {Rel}{MSA}{2B}
 \let\Doteq\doteqdot
\DeclareFlexSymbol{\triangleq}          {Rel}{MSA}{2C}
\DeclareFlexSymbol{\precsim}            {Rel}{MSA}{2D}
\DeclareFlexSymbol{\lesssim}            {Rel}{MSA}{2E}
\DeclareFlexSymbol{\lessapprox}         {Rel}{MSA}{2F}
\DeclareFlexSymbol{\eqslantless}        {Rel}{MSA}{30}
\DeclareFlexSymbol{\eqslantgtr}         {Rel}{MSA}{31}
\DeclareFlexSymbol{\curlyeqprec}        {Rel}{MSA}{32}
\DeclareFlexSymbol{\curlyeqsucc}        {Rel}{MSA}{33}
\DeclareFlexSymbol{\preccurlyeq}        {Rel}{MSA}{34}
\DeclareFlexSymbol{\leqq}               {Rel}{MSA}{35}
\DeclareFlexSymbol{\leqslant}           {Rel}{MSA}{36}
\DeclareFlexSymbol{\lessgtr}            {Rel}{MSA}{37}
\DeclareFlexSymbol{\backprime}          {Ord}{MSA}{38}
\DeclareFlexSymbol{\risingdotseq}       {Rel}{MSA}{3A}
\DeclareFlexSymbol{\fallingdotseq}      {Rel}{MSA}{3B}
\DeclareFlexSymbol{\succcurlyeq}        {Rel}{MSA}{3C}
```

```
\DeclareFlexSymbol{\geqq}               {Rel}{MSA}{3D}
\DeclareFlexSymbol{\geqslant}           {Rel}{MSA}{3E}
\DeclareFlexSymbol{\gtrless}            {Rel}{MSA}{3F}
```

in amsfonts.sty

```
%% \DeclareFlexSymbol{\sqsubset}    {Rel}{MSA}{40}
%% \DeclareFlexSymbol{\sqsupset}    {Rel}{MSA}{41}
\DeclareFlexSymbol{\vartriangleright}   {Rel}{MSA}{42}
\DeclareFlexSymbol{\vartriangleleft}    {Rel}{MSA}{43}
\DeclareFlexSymbol{\trianglerighteq}    {Rel}{MSA}{44}
\DeclareFlexSymbol{\trianglelefteq}     {Rel}{MSA}{45}
\DeclareFlexSymbol{\bigstar}            {Ord}{MSA}{46}
\DeclareFlexSymbol{\between}            {Rel}{MSA}{47}
\DeclareFlexSymbol{\blacktriangledown}  {Ord}{MSA}{48}
\DeclareFlexSymbol{\blacktriangleright} {Rel}{MSA}{49}
\DeclareFlexSymbol{\blacktriangleleft}  {Rel}{MSA}{4A}
\DeclareFlexSymbol{\vartriangle}        {Rel}{MSA}{4D}
\DeclareFlexSymbol{\blacktriangle}      {Ord}{MSA}{4E}
\DeclareFlexSymbol{\triangledown}       {Ord}{MSA}{4F}
\DeclareFlexSymbol{\eqcirc}             {Rel}{MSA}{50}
\DeclareFlexSymbol{\lesseqgtr}          {Rel}{MSA}{51}
\DeclareFlexSymbol{\gtreqless}          {Rel}{MSA}{52}
\DeclareFlexSymbol{\lesseqqgtr}         {Rel}{MSA}{53}
\DeclareFlexSymbol{\gtreqqless}         {Rel}{MSA}{54}
\DeclareFlexSymbol{\Rrightarrow}        {Rel}{MSA}{56}
\DeclareFlexSymbol{\Lleftarrow}         {Rel}{MSA}{57}
\DeclareFlexSymbol{\veebar}             {Bin}{MSA}{59}
\DeclareFlexSymbol{\barwedge}           {Bin}{MSA}{5A}
\DeclareFlexSymbol{\doublebarwedge}     {Bin}{MSA}{5B}
```

In amsfonts.sty

```
%%\DeclareFlexSymbol{\angle}         {Ord}{MSA}{5C}
\DeclareFlexSymbol{\measuredangle}   {Ord}{MSA}{5D}
\DeclareFlexSymbol{\sphericalangle}  {Ord}{MSA}{5E}
\DeclareFlexSymbol{\varpropto}       {Rel}{MSA}{5F}
\DeclareFlexSymbol{\smallsmile}      {Rel}{MSA}{60}
\DeclareFlexSymbol{\smallfrown}      {Rel}{MSA}{61}
\DeclareFlexSymbol{\Subset}          {Rel}{MSA}{62}
\DeclareFlexSymbol{\Supset}          {Rel}{MSA}{63}
\DeclareFlexSymbol{\Cup}             {Bin}{MSA}{64}
 \let\doublecup\Cup
\DeclareFlexSymbol{\Cap}             {Bin}{MSA}{65}
 \let\doublecap\Cap
\DeclareFlexSymbol{\curlywedge}      {Bin}{MSA}{66}
\DeclareFlexSymbol{\curlyvee}        {Bin}{MSA}{67}
\DeclareFlexSymbol{\leftthreetimes}  {Bin}{MSA}{68}
\DeclareFlexSymbol{\rightthreetimes} {Bin}{MSA}{69}
\DeclareFlexSymbol{\subseteqq}       {Rel}{MSA}{6A}
\DeclareFlexSymbol{\supseteqq}       {Rel}{MSA}{6B}
\DeclareFlexSymbol{\bumpeq}          {Rel}{MSA}{6C}
\DeclareFlexSymbol{\Bumpeq}          {Rel}{MSA}{6D}
```

```
\DeclareFlexSymbol{\lll}              {Rel}{MSA}{6E}
 \let\llless\lll
\DeclareFlexSymbol{\ggg}              {Rel}{MSA}{6F}
 \let\gggtr\ggg
\DeclareFlexSymbol{\circledS}         {Ord}{MSA}{73}
\DeclareFlexSymbol{\pitchfork}        {Rel}{MSA}{74}
\DeclareFlexSymbol{\dotplus}          {Bin}{MSA}{75}
\DeclareFlexSymbol{\backsim}          {Rel}{MSA}{76}
\DeclareFlexSymbol{\backsimeq}        {Rel}{MSA}{77}
\DeclareFlexSymbol{\complement}       {Ord}{MSA}{7B}
\DeclareFlexSymbol{\intercal}         {Bin}{MSA}{7C}
\DeclareFlexSymbol{\circledcirc}      {Bin}{MSA}{7D}
\DeclareFlexSymbol{\circledast}       {Bin}{MSA}{7E}
\DeclareFlexSymbol{\circleddash}      {Bin}{MSA}{7F}
```

Begin AMSb declarations

```
\DeclareFlexSymbol{\lvertneqq}        {Rel}{MSB}{00}
\DeclareFlexSymbol{\gvertneqq}        {Rel}{MSB}{01}
\DeclareFlexSymbol{\nleq}             {Rel}{MSB}{02}
\DeclareFlexSymbol{\ngeq}             {Rel}{MSB}{03}
\DeclareFlexSymbol{\nless}            {Rel}{MSB}{04}
\DeclareFlexSymbol{\ngtr}             {Rel}{MSB}{05}
\DeclareFlexSymbol{\nprec}            {Rel}{MSB}{06}
\DeclareFlexSymbol{\nsucc}            {Rel}{MSB}{07}
\DeclareFlexSymbol{\lneqq}            {Rel}{MSB}{08}
\DeclareFlexSymbol{\gneqq}            {Rel}{MSB}{09}
\DeclareFlexSymbol{\nleqslant}        {Rel}{MSB}{0A}
\DeclareFlexSymbol{\ngeqslant}        {Rel}{MSB}{0B}
\DeclareFlexSymbol{\lneq}             {Rel}{MSB}{0C}
\DeclareFlexSymbol{\gneq}             {Rel}{MSB}{0D}
\DeclareFlexSymbol{\npreceq}          {Rel}{MSB}{0E}
\DeclareFlexSymbol{\nsucceq}          {Rel}{MSB}{0F}
\DeclareFlexSymbol{\precnsim}         {Rel}{MSB}{10}
\DeclareFlexSymbol{\succnsim}         {Rel}{MSB}{11}
\DeclareFlexSymbol{\lnsim}            {Rel}{MSB}{12}
\DeclareFlexSymbol{\gnsim}            {Rel}{MSB}{13}
\DeclareFlexSymbol{\nleqq}            {Rel}{MSB}{14}
\DeclareFlexSymbol{\ngeqq}            {Rel}{MSB}{15}
\DeclareFlexSymbol{\precneqq}         {Rel}{MSB}{16}
\DeclareFlexSymbol{\succneqq}         {Rel}{MSB}{17}
\DeclareFlexSymbol{\precnapprox}      {Rel}{MSB}{18}
\DeclareFlexSymbol{\succnapprox}      {Rel}{MSB}{19}
\DeclareFlexSymbol{\lnapprox}         {Rel}{MSB}{1A}
\DeclareFlexSymbol{\gnapprox}         {Rel}{MSB}{1B}
\DeclareFlexSymbol{\nsim}             {Rel}{MSB}{1C}
\DeclareFlexSymbol{\ncong}            {Rel}{MSB}{1D}
\DeclareFlexSymbol{\diagup}           {Ord}{MSB}{1E}
\DeclareFlexSymbol{\diagdown}         {Ord}{MSB}{1F}
\DeclareFlexSymbol{\varsubsetneq}     {Rel}{MSB}{20}
\DeclareFlexSymbol{\varsupsetneq}     {Rel}{MSB}{21}
```

```
\DeclareFlexSymbol{\nsubseteqq}      {Rel}{MSB}{22}
\DeclareFlexSymbol{\nsupseteqq}      {Rel}{MSB}{23}
\DeclareFlexSymbol{\subsetneqq}      {Rel}{MSB}{24}
\DeclareFlexSymbol{\supsetneqq}      {Rel}{MSB}{25}
\DeclareFlexSymbol{\varsubsetneqq}   {Rel}{MSB}{26}
\DeclareFlexSymbol{\varsupsetneqq}   {Rel}{MSB}{27}
\DeclareFlexSymbol{\subsetneq}       {Rel}{MSB}{28}
\DeclareFlexSymbol{\supsetneq}       {Rel}{MSB}{29}
\DeclareFlexSymbol{\nsubseteq}       {Rel}{MSB}{2A}
\DeclareFlexSymbol{\nsupseteq}       {Rel}{MSB}{2B}
\DeclareFlexSymbol{\nparallel}       {Rel}{MSB}{2C}
\DeclareFlexSymbol{\nmid}            {Rel}{MSB}{2D}
\DeclareFlexSymbol{\nshortmid}       {Rel}{MSB}{2E}
\DeclareFlexSymbol{\nshortparallel}  {Rel}{MSB}{2F}
\DeclareFlexSymbol{\nvdash}          {Rel}{MSB}{30}
\DeclareFlexSymbol{\nVdash}          {Rel}{MSB}{31}
\DeclareFlexSymbol{\nvDash}          {Rel}{MSB}{32}
\DeclareFlexSymbol{\nVDash}          {Rel}{MSB}{33}
\DeclareFlexSymbol{\ntrianglerighteq}{Rel}{MSB}{34}
\DeclareFlexSymbol{\ntrianglelefteq} {Rel}{MSB}{35}
\DeclareFlexSymbol{\ntriangleleft}   {Rel}{MSB}{36}
\DeclareFlexSymbol{\ntriangleright}  {Rel}{MSB}{37}
\DeclareFlexSymbol{\nleftarrow}      {Rel}{MSB}{38}
\DeclareFlexSymbol{\nrightarrow}     {Rel}{MSB}{39}
\DeclareFlexSymbol{\nLeftarrow}      {Rel}{MSB}{3A}
\DeclareFlexSymbol{\nRightarrow}     {Rel}{MSB}{3B}
\DeclareFlexSymbol{\nLeftrightarrow} {Rel}{MSB}{3C}
\DeclareFlexSymbol{\nleftrightarrow} {Rel}{MSB}{3D}
\DeclareFlexSymbol{\divideontimes}   {Bin}{MSB}{3E}
\DeclareFlexSymbol{\varnothing}      {Ord}{MSB}{3F}
\DeclareFlexSymbol{\nexists}         {Ord}{MSB}{40}
\DeclareFlexSymbol{\Finv}            {Ord}{MSB}{60}
\DeclareFlexSymbol{\Game}            {Ord}{MSB}{61}
```

In amsfonts.sty:

```
%%\DeclareFlexSymbol{\mho}           {Ord}{MSB}{66}
\DeclareFlexSymbol{\eth}             {Ord}{MSB}{67}
\DeclareFlexSymbol{\eqsim}           {Rel}{MSB}{68}
\DeclareFlexSymbol{\beth}            {Ord}{MSB}{69}
\DeclareFlexSymbol{\gimel}           {Ord}{MSB}{6A}
\DeclareFlexSymbol{\daleth}          {Ord}{MSB}{6B}
\DeclareFlexSymbol{\lessdot}         {Bin}{MSB}{6C}
\DeclareFlexSymbol{\gtrdot}          {Bin}{MSB}{6D}
\DeclareFlexSymbol{\ltimes}          {Bin}{MSB}{6E}
\DeclareFlexSymbol{\rtimes}          {Bin}{MSB}{6F}
\DeclareFlexSymbol{\shortmid}        {Rel}{MSB}{70}
\DeclareFlexSymbol{\shortparallel}   {Rel}{MSB}{71}
\DeclareFlexSymbol{\smallsetminus}   {Bin}{MSB}{72}
\DeclareFlexSymbol{\thicksim}        {Rel}{MSB}{73}
\DeclareFlexSymbol{\thickapprox}     {Rel}{MSB}{74}
```

```
\DeclareFlexSymbol{\approxeq}         {Rel}{MSB}{75}
\DeclareFlexSymbol{\succapprox}       {Rel}{MSB}{76}
\DeclareFlexSymbol{\precapprox}       {Rel}{MSB}{77}
\DeclareFlexSymbol{\curvearrowleft}   {Rel}{MSB}{78}
\DeclareFlexSymbol{\curvearrowright}  {Rel}{MSB}{79}
\DeclareFlexSymbol{\digamma}          {Ord}{MSB}{7A}
\DeclareFlexSymbol{\varkappa}         {Ord}{MSB}{7B}
\DeclareFlexSymbol{\Bbbk}             {Ord}{MSB}{7C}
\DeclareFlexSymbol{\hslash}           {Ord}{MSB}{7D}
```

In amsfonts.sty:

```
%%\DeclareFlexSymbol{\hbar}           {Ord}{MSB}{7E}
\DeclareFlexSymbol{\backepsilon}      {Rel}{MSB}{7F}
\ExplSyntaxOff
⟨/msabm⟩
```

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