The Comprehensive LaTeX Symbol List

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Abstract

This document lists 4947 symbols and the corresponding LaTeX commands that produce them. Some of these symbols are guaranteed to be available in every LaTeX 2ε system; others require fonts and packages that may not accompany a given distribution and that therefore need to be installed. All of the fonts and packages used to prepare this document—as well as this document itself—are freely available from the Comprehensive TeX Archive Network (http://www.ctan.org/).

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1 Introduction

Welcome to the Comprehensive LaTeX Symbol List! This document strives to be your primary source of LaTeX symbol information: font samples, LaTeX commands, packages, usage details, caveats—everything needed to put thousands of different symbols at your disposal. All of the fonts covered herein meet the following criteria:

1. They are freely available from the Comprehensive TeX Archive Network (`http://www.ctan.org`).
2. All of their symbols have LaTeX 2$_\varepsilon$ bindings. That is, a user should be able to access a symbol by name, not just by `\char`⟨*number*⟩.

These are not particularly limiting criteria; the Comprehensive LaTeX Symbol List contains samples of 4947 symbols—quite a large number. Some of these symbols are guaranteed to be available in every LaTeX 2$_\varepsilon$ system; others require fonts and packages that may not accompany a given distribution and that therefore need to be installed. See `http://www.tex.ac.uk/cgi-bin/texfaq2html?label=instpackages+wherefiles` for help with installing new fonts and packages.

1.1 Document Usage

Each section of this document contains a number of font tables. Each table shows a set of symbols, with the corresponding LaTeX command to the right of each symbol. A table's caption indicates what package needs to be loaded in order to access that table's symbols. For example, the symbols in Table 35, "textcomp Old-Style Numerals", are made available by putting "`\usepackage{textcomp}`" in your document's preamble. "$\mathcal{AMS}$" means to use the $\mathcal{AMS}$ packages, viz. amssymb and/or amsmath. Notes below a table provide additional information about some or all the symbols in that table.

One note that appears a few times in this document, particularly in Section 2, indicates that certain symbols do not exist in the OT1 font encoding (Donald Knuth's original, 7-bit font encoding, which is the default font encoding for LaTeX) and that you should use fontenc to select a different encoding, such as T1 (a common 8-bit font encoding). That means that you should put "`\usepackage[`⟨*encoding*⟩`]{fontenc}`" in your document's preamble, where ⟨*encoding*⟩ is, e.g., `T1` or `LY1`. To limit the change in font encoding to the current group, use "`\fontencoding{`⟨*encoding*⟩`}\selectfont`".

Section 7 contains some additional information about the symbols in this document. It shows which symbol names are not unique across packages, gives examples of how to create new symbols out of existing symbols, explains how symbols are spaced in math mode, presents a LaTeX ASCII and Latin 1 tables, and provides some information about this document itself. The Comprehensive LaTeX Symbol List ends with an index of all the symbols in the document and various additional useful terms.

1.2 Frequently Requested Symbols

There are a number of symbols that are requested over and over again on `comp.text.tex`. If you're looking for such a symbol the following list will help you find it quickly.

␣, as in "Spaces␣are␣significant." 9
í, ì, ī, î, etc. (versus í, ì, ī̄, and î) 14
¢ 18
€ 19
©, ®, and ™ 19
‰ 20
∯ 28
∴ 31
:= and ::= 32
≲ and ≳ 39
.·. 66
°, as in "180°" or "15°C" 69
$\mathscr{L}$, $\mathscr{F}$, etc. 70
ℕ, ℤ, ℝ, etc. 70
ƒ 101
á̀, ề, etc. (i.e., several accents per character) 103
<, >, and | (instead of ¡, ¿, and —) 109
ˆ and ˜ (or ∼) 109

2 Body-text symbols

This section lists symbols that are intended for use in running text, such as punctuation marks, accents, ligatures, and currency symbols.

Table 1: LaTeX 2_ε Escapable "Special" Characters

$	\$	%	\%	_	_*	}	\}	&	\&	#	\#	{	\{

* The underscore package redefines "_" to produce an underscore in text mode (i.e., it makes it unnecessary to escape the underscore character).

Table 2: Predefined LaTeX 2_ε Text-mode Commands

	^	\textasciicircum		<	\textless
	~	\textasciitilde	a	a	\textordfeminine
	*	\textasteriskcentered	o	o	\textordmasculine
	\	\textbackslash		¶	\textparagraph*
	|	\textbar		·	\textperiodcentered
	{	\textbraceleft*		¿	\textquestiondown
	}	\textbraceright*		“	\textquotedblleft
	•	\textbullet		”	\textquotedblright
©	©	\textcopyright*		‘	\textquoteleft
	†	\textdagger*		’	\textquoteright
	‡	\textdaggerdbl*	®	®	\textregistered
	$	\textdollar*		§	\textsection*
	...	\textellipsis*		£	\textsterling*
	—	\textemdash	TM	™	\texttrademark
	–	\textendash		_	\textunderscore*
	¡	\textexclamdown		␣	\textvisiblespace
	>	\textgreater			

Where two symbols are present, the left one is the "faked" symbol that LaTeX 2_ε provides by default, and the right one is the "true" symbol that textcomp makes available.

* It's generally preferable to use the corresponding symbol from Table 3 because the symbols in that table work properly in both text mode and math mode.

Table 3: LaTeX 2_ε Commands Defined to Work in Both Math and Text Mode

$	\$	_	_	‡	\ddag	{	\{
¶	\P	©	©	\copyright	...	\dots	}	\}
§	\S	†	\dag	£	\pounds		

Where two symbols are present, the left one is the "faked" symbol that LaTeX 2_ε provides by default, and the right one is the "true" symbol that textcomp makes available.

Table 4: $\mathcal{AMS}$ Commands Defined to Work in Both Math and Text Mode

✓	\checkmark	®	\circledR	✠	\maltese

Table 5: Non-ASCII Letters (Excluding Accented Letters)

å	\aa	Đ	\DH*	Ł	\L	ø	\o	ß	\ss
Å	\AA	ð	\dh*	ł	\l	Ø	\O	SS	\SS
Æ	\AE	Đ	\DJ*	Ŋ	\NG*	Œ	\OE	Þ	\TH*
æ	\ae	đ	\dj*	ŋ	\ng*	œ	\oe	þ	\th*

* Not available in the OT1 font encoding. Use the fontenc package to select an alternate font encoding, such as T1.

Table 6: Letters Used to Typeset African Languages

Đ	\B{D}	ƈ	\m{c}	ƒ	\m{f}	ƙ	\m{k}	ƫ	\M{t}	ȝ	\m{Z}
đ	\B{d}	Ɗ	\m{D}	Ƒ	\m{F}	Ɲ	\m{N}	Ƭ	\M{T}	Ɛ̃	\T{E}
Ħ	\B{H}	ɖ	\M{d}	Ɣ	\m{G}	ŋ	\m{n}	ƭ	\m{t}	ɛ̃	\T{e}
ħ	\B{h}	Ð	\M{D}	ɣ	\m{g}	ɔ	\m{o}	Ʈ	\m{T}	Ɔ̃	\T{O}
ŧ	\B{t}	ƌ	\m{d}	ɭ	\m{I}	Ɔ	\M{O}	ʊ	\m{u}*	ɔ̃	\T{o}
Ŧ	\B{T}	Ɛ	\m{E}	ɩ	\m{i}	Ƥ	\m{P}	Ʊ	\m{U}*		
ɓ	\m{b}	ɛ	\m{e}	Ɲ	\m{J}	ƥ	\m{p}	Ƴ	\m{Y}		
Ɓ	\m{B}	Ǝ	\M{E}	ɲ	\m{j}	ʃ	\m{s}	ƴ	\m{y}		
Ƈ	\m{C}	ə	\M{e}	Ƙ	\m{K}	Ʃ	\m{S}	ʒ	\m{z}		

These characters all need the T4 font encoding, which is provided by the fc package.

* \m{v} and \m{V} are synonyms for \m{u} and \m{U}.

Table 7: Letters Used to Typeset Vietnamese

Ơ	\OHORN	ơ	\ohorn	Ư	\UHORN	ư	\uhorn

These characters all need the T5 font encoding, which is provided by the vntex package.

Table 8: Punctuation Marks Not Found in OT1

«	\guillemotleft	‹	\guilsinglleft	„	\quotedblbase	"	\textquotedbl
»	\guillemotright	›	\guilsinglright	‚	\quotesinglbase		

To get these symbols, use the fontenc package to select an alternate font encoding, such as T1.

Table 9: pifont Decorative Punctuation Marks

❛	\ding{123}	❝	\ding{125}	❡	\ding{161}	❣	\ding{163}
❜	\ding{124}	❞	\ding{126}	❢	\ding{162}		

Table 10: tipa Phonetic Symbols

ɤ	\textbabygamma	ʔ	\textglotstop	ɳ	\textrtailn
ƀ	\textbarb	ˑ	\texthalflength	ɽ	\textrtailr
ɕ	\textbarc	ъ	\texthardsign	ʂ	\textrtails
đ	\textbard	ʿ	\texthooktop	ʈ	\textrtailt
ɟ	\textbardotlessj	ɓ	\texthtb	ʐ	\textrtailz
ɠ	\textbarg	ʄ	\texthtbardotlessj	ɻ	\textrthook
ʔ	\textbarglotstop	ƈ	\texthtc	ʌ	\textsca
ɨ	\textbari	ɗ	\texthtd	ʙ	\textscb
ɬ	\textbarl	ɠ	\texthtg	ɛ	\textsce
ɵ	\textbaro	ɦ	\textthth	ɢ	\textscg
ʕ	\textbarrevglotstop	ʃ	\texththeng	ʜ	\textsch
ʉ	\textbaru	ƙ	\texthtk	ə	\textschwa
ɮ	\textbeltl	ꝑ	\texthtp	ɪ	\textsci
β	\textbeta	ɋ	\texthtq	ʝ	\textscj
ʘ	\textbullseye	ɖ	\texthtrtaild	ʟ	\textscl
ˊ	\textceltpal	ƭ	\texthtscg	ɴ	\textscn
χ	\textchi	ʈ	\texthtt	œ	\textscoelig
ɔ	\textcloseepsilon	ʰ	\texthvlig	ɷ	\textscomega
ɷ	\textcloseomega	ƪ	\textinvglotstop	ʀ	\textscr
ɞ	\textcloserevepsilon	ʁ	\textinvscr	ɑ	\textscripta
ʐ	\textcommatailz	ɩ	\textiota	ɡ	\textscriptg
ˤ	\textcorner	ʎ	\textlambda	ʊ	\textscriptv
ƀ	\textcrb	ː	\textlengthmark	ᴜ	\textscu
đ	\textcrd	ʯ	\textlhookt	ʏ	\textscy
ɡ	\textcrg	ɭ	\textlhtlongi	ˌ	\textsecstress
ħ	\textcrh	ʮ	\textlhtlongy	ъ	\textsoftsign
ƪ	\textcrinvglotstop	ɾ	\textlonglegr	ʗ	\textstretchc
ƛ	\textcrlambda	˂	\textlptr	ʦ	\texttctclig
ƻ	\textcrtwo	ɱ	\textltailm	ʧ	\textteshlig
ɕ	\textctc	ɲ	\textltailn	θ	\textttheta
ɖ	\textctd	ɬ	\textltilde	þ	\textthorn
ʣ	\textctdctzlig	ɮ	\textlyoghlig	|	\texttoneletterstem
ʃ	\textctesh	ʝ	\textObardotlessj	ʦ	\texttslig
ʝ	\textctj	ɮ	\textOlyoghlig	ʊ	\textturna
ɳ	\textctn	ω	\textomega	œ	\textturncelig
ʇ	\textctt	ˠ	\textopencorner	ɥ	\textturnh
ʧ	\textcttctclig	ɔ	\textopeno	ʞ	\textturnk
ʒ	\textctyogh	ˌ	\textpalhook	ʟ	\textturnlonglegr
ʑ	\textctz	ɸ	\textphi	ɯ	\textturnm

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(continued from previous page)

ʤ	\textdctzlig	ǀ	\textpipe	ɯ̟	\textturnmrleg
ꬶ	\textdoublebaresh	ˈ	\textprimstress	ɹ	\textturnr
ǂ	\textdoublebarpipe	ʔ	\textraiseglotstop	ɻ	\textturnrrtail
⫽	\textdoublebarslash	˞	\textraisevibyi	ɒ	\textturnscripta
‖	\textdoublepipe	ɤ	\textramshorns	ʇ	\textturnt
‖	\textdoublevertline	ʿ	\textrevapostrophe	ʌ	\textturnv
↓	\textdownstep	ɘ	\textreve	ʍ	\textturnw
ʤ	\textdyoghlig	ɜ	\textrevepsilon	ʎ	\textturny
ʣ	\textdzlig	ʕ	\textrevglotstop	ʊ	\textupsilon
ɛ	\textepsilon	ʢ	\textrevyogh	↑	\textupstep
ʃ	\textesh	ɜ˞	\textrhookrevepsilon	ǀ	\textvertline
ɾ	\textfishhookr	ɚ	\textrhookschwa	ɺ	\textvibyi
g	\textg	˷	\textrhoticity	ʏ̞	\textvibyy
ɣ	\textgamma	˃	\textrptr	þ	\textwynn
↘	\textglobfall	ɖ	\textrtaild	ʒ	\textyogh
↗	\textglobrise	ɭ	\textrtaill		

tipa defines shortcut characters for many of the above. It also defines a command \tone for denoting tone letters (pitches). See the tipa documentation for more information.

TABLE 11: tipx Phonetic Symbols

æ	\textaolig	ʃ	\texthtbardotlessjvar	˔	\textrthooklong
ʒ	\textbenttailyogh	ʊ	\textinvomega	ᴂ	\textscaolig
ɣ	\textbktailgamma	ʌ	\textinvsca	ᴀ	\textscdelta
ʖ	\textctinvglotstop	ɑ	\textinvscripta	ꜰ	\textscf
ʝ	\textctjvar	ɬ	\textlfishhookrlig	ᴋ	\textsck
ʗ	\textctstretchc	ɟ	\textlhookfour	ᴍ	\textscm
ɕ	\textctstretchcvar	ɲ	\textlhookp	ᴘ	\textscp
ʯ	\textctturnt	ɪ	\textlhti	ǫ	\textscq
ȸ	\textdblig	ɮ	\textlooptoprevesh	←	\textspleftarrow
ǂ	\textdoublebarpipevar	ŋ	\textnrleg	ɕ	\textstretchcvar
‖	\textdoublepipevar	⊙	\textObullseye	↔	\textsubdoublearrow
↓	\textdownfullarrow	˩	\textpalhooklong	→	\textsubrightarrow
♀	\textfemale	ʲ	\textpalhookvar	þ	\textthornvari
ɲ	\textfrbarn	ǀ	\textpipevar	þ	\textthornvarii
ɗ	\textfrhookd	ʠ	\textqplig	þ	\textthornvariii
ɗ	\textfrhookdvar	▯	\textrectangle	þ	\textthornvariv
ʈ	\textfrhookt	ɾ	\textretractingvar	ʡ	\textturnglotstop
ɣ	\textfrtailgamma	ɹ	\textrevscl	ʞ	\textturnsck
ʔ	\textglotstopvari	ʁ	\textrevscr	ᴖ	\textturnscu
ʔ	\textglotstopvarii	ɑ̢	\textrhooka	ɛ	\textturnthree
ʔ	\textglotstopvariii	e̢	\textrhooke	ƻ	\textturntwo
ɣ	\textgrgamma	ɛ̢	\textrhookepsilon	♀	\textuncrfemale
ɧ	\textheng	ɒ̢	\textrhookopeno	↑	\textupfullarrow
h	\texthmlig	ɳ	\textrtailhth		

Table 13: wsuipa Phonetic Symbols

ɤ	\babygamma	ŋ	\eng	ɱ	\labdentalnas	ə	\schwa
ƀ	\barb	ɚ	\er	ɬ	\latfric	ɪ	\sci
đ	\bard	ʃ	\esh	ɯ̟	\legm	ɴ	\scn
ɨ	\bari	ð	\eth	ɾ	\legr	ʀ	\scr
ɬ	\barl	ɾ	\flapr	ɮ	\lz	ɑ	\scripta
ɵ	\baro	ʔ	\glotstop	ɑ	\nialpha	ɡ	\scriptg
ᵽ	\barp	ɓ	\hookb	β	\nibeta	ʊ	\scriptv
ɨ	\barsci	ɗ	\hookd	χ	\nichi	ᴜ	\scu
ʉ	\barscu	ɠ	\hookg	ɛ	\niepsilon	ʏ	\scy
ʉ	\baru	ɦ	\hookh	ɣ	\nigamma	ⱱ	\slashb
ʘ	\clickb	ʄ	\hookheng	ɩ	\niiota	ɕ	\slashc
ǁ	\clickc	ɜ̩	\hookrevepsilon	ʎ	\nilambda	ɖ	\slashd
ǂ	\clickt	ʰʊ	\hv	ω	\niomega	ʉ	\slashu
ɷ	\closedniomega	ʋ	\inva	ɸ	\niphi	ᶑ	\taild
ɞ	\closedrevepsilon	ɻ	\invf	σ	\nisigma	ɻ̩	\tailinvr
ƀ	\crossb	ɓ	\invglotstop	θ	\nitheta	ɭ	\taill
đ	\crossd	ɥ	\invh	ʊ	\niupsilon	ɳ	\tailn
ħ	\crossh	ɺ	\invlegr	ɲ	\nj	ɽ	\tailr
ƛ	\crossnilambda	ɯ	\invm	œ	\oo	ʂ	\tails
ɕ	\curlyc	ɹ	\invr	ɔ	\openo	ʈ	\tailt
ʃ̬	\curlyesh	ʁ	\invscr	ɘ	\reve	ᶎ	\tailz
ʒ̬	\curlyyogh	ɒ	\invscripta	ʕ	\reveject	ʧ	\tesh
ʑ	\curlyz	ʌ	\invv	ɜ	\revepsilon	þ	\thorn
ɨ	\dlbari	ʍ	\invw	ʕ	\revglotstop	ƫ	\tildel
ʤ	\dz	ʎ	\invy	ᴅ	\scd	ʒ	\yogh
ʔ	\ejective	ɣ	\ipagamma	ɢ	\scg		

Table 14: wasysym Phonetic Symbols

Ð	\DH	ð	\dh	ɔ	\openo
Þ	\Thorn	ə	\inve	þ	\thorn

Table 15: phonetic Phonetic Symbols

ɟ	\barj	ɾ	\flap	ɨ	\ibar	ɒ	\rotvara	ɪ	\vari
ƛ	\barlambda	ʔ	\glottal	ɔ	\openo	ʍ	\rotw	ɷ	\varomega
ɱ	\emgma	Ɓ	\hausaB	ħ	\planck	ʎ	\roty	ɔ	\varopeno
ŋ	\engma	ɓ	\hausab	ʌ	\pwedge	ə	\schwa	ⱱ	\vod
ɲ	\enya	ɗ	\hausad	Ɖ	\revD	þ	\thorn	ɦ	\voicedh
ɛ	\epsi	Ɗ	\hausaD	ɹ	\riota	ʉ	\ubar	ʒ	\yogh
ʃ	\esh	ƙ	\hausak	ɯ	\rotm	ɥ	\udesc		
ð	\eth	Ƙ	\hausaK	ʊ	\rotOmega	ɑ	\vara		
ʄ	\fj	ɗ	\hookd	ɹ	\rotr	ɡ	\varg		

Table 16: t4phonet Phonetic Symbols

đ	\textcrd	ƈ	\texthtd	ǀ	\textpipe
ħ	\textcrh	ƙ	\texthtk	ɖ	\textrtaild
ɛ	\textepsilon	ƥ	\texthtp	ʈ	\textrtailt
ʃ	\textesh	ƭ	\texthtt	ƈ	\textschwa
ʩ	\textfjlig	ɩ	\textiota	ʃ	\textscriptv
ɓ	\texthtb	ɲ	\textltailn	ʧ	\textteshlig
ƈ	\texthtc	ɔ	\textopeno	ʒ	\textyogh

The idea behind the t4phonet package's phonetic symbols is to provide an interface to some of the characters in the T4 font encoding (Table 6 on page 10) but using the same names as the tipa characters presented in Table 10 on page 11.

Table 17: semtrans Transliteration Symbols

ʾ	\Alif	ʿ	\Ayn

Table 18: Text-mode Accents

Ää	\"{A}\"{a}	Àà	\‘{A}\‘{a}	Ạạ	\d{A}\d{a}	Åå	\r{A}\r{a}
Áá	\’{A}\’{a}	Ȧȧ	|{A}|{a}‡	Ää	\G{A}\G{a}‡	A͡a͡	\t{A}\t{a}
Ȧȧ	\.{A}\.{a}	Ãã	\~{A}\~{a}	Åå	\h{A}\h{a}§	Ăă	\u{A}\u{a}
Āā	\={A}\={a}	A̲a̲	\b{A}\b{a}	Ő̈ő̈	\H{A}\H{a}	Ää	\U{A}\U{a}‡
Ââ	\^{A}\^{a}	Ąą	\c{A}\c{a}	Ąą	\k{A}\k{a}†	Ǎǎ	\v{A}\v{a}

A͡a͡ \newtie{A}\newtie{a}* Ⓐⓐ \textcircled{A}\textcircled{a}

* Requires the textcomp package.

† Not available in the OT1 font encoding. Use the fontenc package to select an alternate font encoding, such as T1.

‡ Requires the T4 font encoding, provided by the fc package.

§ Requires the T5 font encoding, provided by the vntex package.

Also note the existence of `\i` and `\j`, which produce dotless versions of "i" and "j" (viz., "ı" and "ȷ"). These are useful when the accent is supposed to replace the dot. For example, "`na\"{\i}ve`" produces a correct "naïve", while "`na\"{i}ve`" would yield the rather odd-looking "naïve". ("`na\"{i}ve`" *does* work in encodings other than OT1, however.)

TABLE 19: tipa Text-mode Accents

Ǻǻ \textacutemacron{A}\textacutemacron{a}
Ǻǻ \textacutewedge{A}\textacutewedge{a}
Ą̈ą̈ \textadvancing{A}\textadvancing{a}
A͡a \textbottomtiebar{A}\textbottomtiebar{a}
Ă̲ă̲ \textbrevemacron{A}\textbrevemacron{a}
Ãã \textcircumacute{A}\textcircumacute{a}
Ȧ̂ȧ̂ \textcircumdot{A}\textcircumdot{a}
Ǎǎ \textdotacute{A}\textdotacute{a}
Ḁ̆ḁ̆ \textdotbreve{A}\textdotbreve{a}
Ḁ̆ḁ̆ \textdotbreve{A}\textdotbreve{a}
Ȁȁ \textdoublegrave{A}\textdoublegrave{a}
A̋a̋ \textdoublevbaraccent{A}\textdoublevbaraccent{a}
Ȃâ \textgravecircum{A}\textgravecircum{a}
Ȧ̀ȧ̀ \textgravedot{A}\textgravedot{a}
Ā̀ā̀ \textgravemacron{A}\textgravemacron{a}
Ȁȁ \textgravemid{A}\textgravemid{a}
Ą̽ą̽ \textinvsubbridge{A}\textinvsubbridge{a}
Ą̞ą̞ \textlowering{A}\textlowering{a}
Ǻǻ \textmidacute{A}\textmidacute{a}
Ǎǎ \textovercross{A}\textovercross{a}
A̋a̋ \textoverw{A}\textoverw{a}
Ąą \textpolhook{A}\textpolhook{a}
Ą̝ą̝ \textraising{A}\textraising{a}
Ą̟ą̟ \textretracting{A}\textretracting{a}
Å̊å̊ \textringmacron{A}\textringmacron{a}
Ââ \textroundcap{A}\textroundcap{a}
Ą̼ą̼ \textseagull{A}\textseagull{a}
Ą̗ą̗ \textsubacute{A}\textsubacute{a}
Ą̯ą̯ \textsubarch{A}\textsubarch{a}
Ą̲ą̲ \textsubbar{A}\textsubbridge{a}
Ą̪ą̪ \textsubbridge{A}\textsubbridge{a}
Ą̭ą̭ \textsubcircum{A}\textsubcircum{a}
Ạạ \textsubdot{A}\textsubdot{a}
Ą̖ą̖ \textsubgrave{A}\textsubgrave{a}
Ą̡ą̡ \textsublhalfring{A}\textsublhalfring{a}
Ą̱ą̱ \textsubplus{A}\textsubplus{a}
Ą̜ą̜ \textsubrhalfring{A}\textsubrhalfring{a}

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Aa̰ \textsubring{A}\textsubring{a}
Aa̻ \textsubsquare{A}\textsubsquare{a}
Aa̰ \textsubtilde{A}\textsubtilde{a}
Aa̤ \textsubumlaut{A}\textsubumlaut{a}
Aa̬ \textsubw{A}\textsubw{a}
Aa̯ \textsubwedge{A}\textsubwedge{a}
A̶a̶ \textsuperimposetilde{A}\textsuperimposetilde{a}
Aa̩ \textsyllabic{A}\textsyllabic{a}
Ãã̰ \texttildedot{A}\texttildedot{a}
A͡a͡ \texttoptiebar{A}\texttoptiebar{a}
Aa᷈ \textvbaraccent{A}\textvbaraccent{a}

tipa defines shortcut sequences for many of the above. See the tipa documentation for more information.

TABLE 20: extraipa Text-mode Accents

A͇a͇ \bibridge{A}\bibridge{a}
Á̸á̸ \crtilde{A}\crtilde{a}
Ã̤ã̤ \dottedtilde{A}\dottedtilde{a}
Ã̰ã̰ \doubletilde{A}\doubletilde{a}
Aa͒ \finpartvoice{A}\finpartvoice{a}
Aḁ͒ \finpartvoiceless{A}\finpartvoiceless{a}
Aa̹ \inipartvoice{A}\inipartvoice{a}
Aa̜ \inipartvoiceless{A}\inipartvoiceless{a}
A͆a͆ \overbridge{A}\overbridge{a}
Aa̺ \partvoice{A}\partvoice{a}
Aa̪ \partvoiceless{A}\partvoiceless{a}
Aa⟶ \sliding{A}\sliding{a}
Aa↔ \spreadlips{A}\spreadlips{a}
Aa̹ \subcorner{A}\subcorner{a}
Aa̿ \subdoublebar{A}\subdoublebar{a}
Aa̎ \subdoublevert{A}\subdoublevert{a}
Aa̹ \sublptr{A}\sublptr{a}
Aa̺ \subrptr{A}\subrptr{a}
Aa̹ \whistle{A}\whistle{a}

TABLE 21: wsuipa Text-mode Accents

Aa̪ \dental{A}\dental{a}
Aa̠ \underarch{A}\underarch{a}

Table 22: phonetic Text-mode Accents

A̲a̲	`\hill{A}\hill{a}`	A̪a̪	`\rc{A}\rc{a}`	A̰a̰	`\ut{A}\ut{a}`
Åå	`\od{A}\od{a}`	Ạạ	`\syl{A}\syl{a}`		
Åå	`\ohill{A}\ohill{a}`	A̤a̤	`\td{A}\td{a}`		

The phonetic package provides a few additional macros for linguistic accents. `\acbar` and `\acarc` compose characters with multiple accents; for example, `\acbar{\'}{a}` produces "á" and `\acarc{\"}{e}` produces "e̋". `\labvel` joins two characters with an arc: `\labvel{mn}` → "m͡n". `\upbar` is intended to go between characters as in "`x\upbar{}y''` → "x|y". Lastly, `\uplett` behaves like `\textsuperscript` but uses a smaller font. Contrast "`p\uplett{h}''` → "p$^{\text{h}}$" with "`p\textsuperscript{h}''` → "p$^{\text{h}}$".

Table 23: metre Text-mode Accents

Áá	`\acutus{A}\acutus{a}`
Ăă	`\breve{A}\breve{a}`
Ãã	`\circumflexus{A}\circumflexus{a}`
Ää	`\diaeresis{A}\diaeresis{a}`
Àà	`\gravis{A}\gravis{a}`
Āā	`\macron{A}\macron{a}`

Table 24: t4phonet Text-mode Accents

Ä̏ä̏	`\textdoublegrave{A}\textdoublegrave{a}`
Ȧ̀ȧ̀	`\textvbaraccent{A}\textvbaraccent{a}`
Ä̆ä̆	`\textdoublevbaraccent{A}\textdoublevbaraccent{a}`

The idea behind the t4phonet package's text-mode accents is to provide an interface to some of the accents in the T4 font encoding (accents marked with "‡" in Table 18 on page 14) but using the same names as the tipa accents presented in Table 19 on page 15.

Table 25: arcs Text-mode Accents

A͡ā	`\overarc{A}\overarc{a}`	A͜a͜	`\underarc{A}\underarc{a}`

The accents shown above scale only to a few characters wide. An optional macro argument alters the effective width of the accented characters. See the arcs documentation for more information.

Table 26: semtrans Accents

A̤a̤	\D{A}\D{a}	A͡a͡	\U{A}\U{a}
∀ɐ	\T{A}\T{a}*		

\T is not actually an accent but a command that rotates its argument 180° using the graphicx package's \rotatebox command.

Table 27: wsuipa Diacritics

ʿ	\ain	˂	\leftp	˚	\overring	ˈ	\stress	ˬ	\underwedge
˥	\corner	˧	\leftt	˛	\polishhook	ˌ	\syllabic	ˆ	\upp
˅	\downp	ː	\length	˃	\rightp	¨	\underdots	˩	\upt
˧	\downt	~	\midtilde	˦	\rightt	˚	\underring		
ˑ	\halflength	˓	\open	ˌ	\secstress	~	\undertilde		

The wsuipa package defines all of the above as ordinary characters, not as accents. However, it does provide \diatop and \diaunder commands, which are used to compose diacritics with other characters. For example, \diatop[\overring|a] produces "å", and \diaunder[\underdots|a] produces "a̤". See the wsuipa documentation for more information.

Table 28: textcomp Diacritics

˝	\textacutedbl	ˇ	\textasciicaron	¯	\textasciimacron
´	\textasciiacute	¨	\textasciidieresis	‟	\textgravedbl
˘	\textasciibreve	`	\textasciigrave		

The textcomp package defines all of the above as ordinary characters, not as accents.

Table 29: textcomp Currency Symbols

฿	\textbaht	$	\textdollar*	₲	\textguarani	₩	\textwon
¢	\textcent	$	\textdollaroldstyle	£	\textlira	¥	\textyen
¢	\textcentoldstyle	đ	\textdong	₦	\textnaira		
₡	\textcolonmonetary	€	\texteuro	₱	\textpeso		
¤	\textcurrency	f	\textflorin	£	\textsterling*		

* It's generally preferable to use the corresponding symbol from Table 3 on page 9 because the symbols in that table work properly in both text mode and math mode.

TABLE 30: marvosym Currency Symbols

ℛ	\Denarius	€	\EUR	€	\EURdig	€	\EURtm	ℬ	\Pfund
@	\Ecommerce	€	\EURcr	€	\EURhv	$	\EyesDollar	β	\Shilling

The different euro signs are meant to be visually compatible with different fonts—Courier (\EURcr), Helvetica (\EURhv), Times Roman (\EURtm), and the marvosym digits listed in Table 182 (\EURdig). The mathdesign package redefines \texteuro to be visually compatible with one of three additional fonts: Utopia (€), Charter (€), or Garamond (€).

TABLE 31: wasysym Currency Symbols

¢	\cent	¤	\currency

TABLE 32: eurosym Euro Signs

€	\geneuro	€	\geneuronarrow	€	\geneurowide	€	\officialeuro

\euro is automatically mapped to one of the above—by default, \officialeuro—based on a eurosym package option. See the eurosym documentation for more information. The \geneuro... characters are generated from the current body font's "C" character and therefore may not appear exactly as shown.

TABLE 33: textcomp Legal Symbols

Ⓟ	\textcircledP	©	©	\textcopyright	SM	SM	\textservicemark
ↄ	\textcopyleft	®	®	\textregistered	TM	TM	\texttrademark

Where two symbols are present, the left one is the "faked" symbol that LaTeX 2_ε provides by default, and the right one is the "true" symbol that textcomp makes available.

See http://www.tex.ac.uk/cgi-bin/texfaq2html?label=tradesyms for solutions to common problems that occur when using these symbols (e.g., getting a "ⓡ" when you expected to get a "®").

TABLE 34: cclicenses Creative Commons License Icons

🅭	\cc	🅯	\ccby	🅮	\ccnc*	🅰	\ccnd	🅱	\ccsa*

* These symbols utilize the rotating package and therefore display improperly in most DVI viewers.

Table 35: textcomp Old-style Numerals

0	\textzerooldstyle	4	\textfouroldstyle	8	\texteightoldstyle
1	\textoneoldstyle	5	\textfiveoldstyle	9	\textnineoldstyle
2	\texttwooldstyle	6	\textsixoldstyle		
3	\textthreeoldstyle	7	\textsevenoldstyle		

Rather than use the bulky \textoneoldstyle, \texttwooldstyle, etc. commands shown above, consider using \oldstylenums{...} to typeset an old-style number.

Table 36: Miscellaneous textcomp Symbols

*	\textasteriskcentered	a	a	\textordfeminine
‖	\textbardbl	o	o	\textordmasculine
◯	\textbigcircle		¶	\textparagraph*
ƀ	\textblank		·	\textperiodcentered
¦	\textbrokenbar		‰	\textpertenthousand
•	\textbullet		‰	\textperthousand
†	\textdagger*		¶	\textpilcrow
‡	\textdaggerdbl*		'	\textquotesingle
=	\textdblhyphen		'	\textquotestraightbase
=	\textdblhyphenchar		"	\textquotestraightdblbase
⁒	\textdiscount		℞	\textrecipe
℮	\textestimated		※	\textreferencemark
‽	\textinterrobang		§	\textsection*
¡	\textinterrobangdown		—	\textthreequartersemdash
♪	\textmusicalnote		~	\texttildelow
№	\textnumero		—	\texttwelveudash
○	\textopenbullet			

Where two symbols are present, the left one is the "faked" symbol that LaTeX 2_ε provides by default, and the right one is the "true" symbol that textcomp makes available.

* It's generally preferable to use the corresponding symbol from Table 3 on page 9 because the symbols in that table work properly in both text mode and math mode.

Table 37: Miscellaneous wasysym Text-mode Symbols

‰	\permil

3 Mathematical symbols

Most, but not all, of the symbols in this section are math-mode only. That is, they yield a "`Missing $ inserted`" error message if not used within `$...$`, `\[...\]`, or another math-mode environment. Operators marked as "variable-sized" are taller in displayed formulas, shorter in in-text formulas, and possibly shorter still when used in various levels of superscripts or subscripts.

Alphanumeric symbols (e.g., "$\mathscr{L}$" and "$\mathbb{Z}$") are usually produced using one of the math alphabets in Table 196 rather than with an explicit symbol command. Look there first if you need a symbol for a transform, number set, or some other alphanumeric.

Although there have been many requests on `comp.text.tex` for a contradiction symbol, the ensuing discussion invariably reveals innumerable ways to represent contradiction in a proof, including "$\lightning$" (`\blitza`), "$\Rightarrow\Leftarrow$" (`\Rightarrow\Leftarrow`), "$\bot$" (`\bot`), "$\nleftrightarrow$" (`\nleftrightarrow`), and "※" (`\textreferencemark`). Because of the lack of notational consensus, it is probably better to spell out "Contradiction!" than to use a symbol for this purpose. Similarly, discussions on `comp.text.tex` have revealed that there are a variety of ways to indicate the mathematical notion of "is defined as". Common candidates include "$\triangleq$" (`\triangleq`), "$\equiv$" (`\equiv`), "$:=$" (`\coloneqq`), and "$\stackrel{\text{def}}{=}$" (`\stackrel{\text{\tiny def}}{=}`). See also the example of `\equalsfill` on page 103. Depending upon the context, disjoint union may be represented as "$\coprod$" (`\coprod`), "$\sqcup$" (`\sqcup`), "$\cup$" (`\dotcup`), "$\oplus$" (`\oplus`), or any of a number of other symbols.[1] Finally, the average value of a variable x is written by some people as "$\overline{x}$" (`\overline{x}`), by some people as "$\langle x \rangle$" (`\langle x \rangle`), and by some people as "$\varnothing x$" or "$\varnothing x$" (`\diameter x` or `\varnothing x`). The moral of the story is that you should be careful always to explain your notation to avoid confusing your readers.

Table 38: Math-Mode Versions of Text Symbols

$	`\mathdollar`	¶	`\mathparagraph`	£	`\mathsterling`
...	`\mathellipsis`	§	`\mathsection`	_	`\mathunderscore`

It's generally preferable to use the corresponding symbol from Table 3 on page 9 because the symbols in that table work properly in both text mode and math mode.

Table 39: cmll Unary Operators

!	`\oc`*	↑	`\shneg`	?	`\wn`*
↕	`\shift`	↓	`\shpos`		

* `\oc` and `\wn` differ from "!" and "?" in terms of their math-mode spacing: `$A=!B$` produces "$A =!B$", for example, while `$A=\oc B$` produces "$A = !B$".

[1] Bob Tennent listed these and other disjoint-union symbol possibilities in a November 2007 post to `comp.text.tex`.

TABLE 40: Binary Operators

∐	\amalg	∪	\cup	⊕	\oplus	×	\times
∗	\ast	†	\dagger	⊘	\oslash	◁	\triangleleft
◯	\bigcirc	‡	\ddagger	⊗	\otimes	▷	\triangleright
▽	\bigtriangledown	⋄	\diamond	±	\pm	⊴	\unlhd*
△	\bigtriangleup	÷	\div	⊳	\rhd*	⊵	\unrhd*
•	\bullet	◁	\lhd*	\	\setminus	⊎	\uplus
∩	\cap	∓	\mp	⊓	\sqcap	∨	\vee
·	\cdot	⊙	\odot	⊔	\sqcup	∧	\wedge
∘	\circ	⊖	\ominus	⋆	\star	≀	\wr

* Not predefined in LaTeX 2_ε. Use one of the packages latexsym, amsfonts, amssymb, txfonts, pxfonts, or wasysym.

TABLE 41: $\mathcal{AMS}$ Binary Operators

⊼	\barwedge	⊚	\circledcirc	⊺	\intercal
⊡	\boxdot	⊝	\circleddash	⋋	\leftthreetimes
⊟	\boxminus	⋓	\Cup	⋉	\ltimes
⊞	\boxplus	⋎	\curlyvee	⋌	\rightthreetimes
⊠	\boxtimes	⋏	\curlywedge	⋊	\rtimes
⋒	\Cap	⋇	\divideontimes	⧹	\smallsetminus
∙	\centerdot	∔	\dotplus	⩒	\veebar
⊛	\circledast	⩑	\doublebarwedge		

TABLE 42: stmaryrd Binary Operators

ϕ	\baro	⫼	\interleave	⊛	\varoast
⫽	\bbslash	◅	\leftslice	⊍	\varobar
&	\binampersand	⩛	\merge	⦸	\varobslash
⅋	\bindnasrepma	⊖	\minuso	◎	\varocircle
⊠	\boxast	⫫	\moo	⊙	\varodot
⊟	\boxbar	⨦	\nplus	⧁	\varogreaterthan
⧈	\boxbox	⊍	\obar	⧀	\varolessthan
⧅	\boxbslash	▭	\oblong	⊖	\varominus
⧇	\boxcircle	⦸	\obslash	⊕	\varoplus
⊡	\boxdot	⧁	\ogreaterthan	⊘	\varoslash
□	\boxempty	⧀	\olessthan	⊗	\varotimes
⧄	\boxslash	⍱	\ovee	⍱	\varovee
⋎	\curlyveedownarrow	⍲	\owedge	⍲	\varowedge
⋏	\curlyveeuparrow	⧐	\rightslice	⨯	\vartimes
⫛	\curlywedgedownarrow	⫽	\sslash	⟙	\Ydown
⫚	\curlywedgeuparrow	⫿	\talloblong	⟛	\Yleft
⧵	\fatbslash	◯	\varbigcirc	⟜	\Yright
⨟	\fatsemi	⋎	\varcurlyvee	⟘	\Yup
⫻	\fatslash	⋏	\varcurlywedge		

Table 43: wasysym Binary Operators

◁	\lhd	○	\ocircle	►	\RHD	⊵	\unrhd
◄	\LHD	▷	\rhd	⊴	\unlhd		

Table 44: txfonts/pxfonts Binary Operators

⦶	\circledbar	⦸	\circledwedge	○	\medcirc
⦸	\circledbslash	⅋	\invamp	⊞	\sqcapplus
⩒	\circledvee	●	\medbullet	⊞	\sqcupplus

Table 45: mathabx Binary Operators

∗	\ast	⋏	\curlywedge	⊓	\sqcap
✻	\Asterisk	⨪	\divdot	⊔	\sqcup
⩛	\barwedge	⋇	\divideontimes	⩏	\sqdoublecap
★	\bigstar	∸	\dotdiv	⩐	\sqdoublecup
✱	\bigvarstar	∔	\dotplus	▫	\square
◆	\blackdiamond	⋇	\dottimes	⊞	\squplus
∩	\cap	⩚	\doublebarwedge	·	\udot
⨣	\circplus	⋒	\doublecap	⊎	\uplus
⁎	\coasterisk	⋓	\doublecup	⋆	\varstar
✲	\coAsterisk	⋉	\ltimes	∨	\vee
✳	\convolution	⟴	\pluscirc	⩡	\veebar
∪	\cup	⋊	\rtimes	⩢	\veedoublebar
⋎	\curlyvee	▪	\sqbullet	∧	\wedge

Many of the above glyphs go by multiple names. \centerdot is equivalent to \sqbullet, and \ast is equivalent to *. \asterisk produces the same glyph as \ast, but as an ordinary symbol, not a binary operator. Similarly, \bigast produces a large-operator version of the \Asterisk binary operator, and \bigcoast produces a large-operator version of the \coAsterisk binary operator.

Table 46: MnSymbol Binary Operators

⨿	\amalg	⩏	\doublesqcup	∴	\righttherefore
∗	\ast	⩛	\doublevee	⋏	\rightthreetimes
⍀	\backslashdiv	⩓	\doublewedge	⊱	\rightY
⋈	\bowtie	∵	\downtherefore	⋊	\rtimes
•	\bullet	⊻	\downY	⍁	\slashdiv
∩	\cap	⧢	\dtimes	∏	\smallprod
⩀	\capdot	⁘	\fivedots	⊓	\sqcap
⩄	\capplus	∞	\hbipropto	⩐	\sqcapdot
·	\cdot	‥	\hdotdot	⩔	\sqcapplus
∘	\circ	⌜	\lefthalfcap	⊔	\sqcup
⋎	\closedcurlyvee	⌞	\lefthalfcup	⩑	\sqcupdot
⋏	\closedcurlywedge	∶	\leftthere fore	⩖	\sqcupplus
∪	\cup	⋋	\leftthreetimes	⁝	\squaredots
⊍	\cupdot	⊰	\leftY	×	\times
⊎	\cupplus	⋉	\ltimes	⋰	\udotdot
⋎	\curlyvee	∖	\medbackslash	∴	\uptherefore
⋟	\curlyveedot	○	\medcircle	⊁	\upY
⋏	\curlywedge	⁄	\medslash	⧖	\utimes
⋔	\curlywedgedot	∣	\medvert	⫿	\vbipropto
⋱	\ddotdot	∣·	\medvertdot	:	\vdotdot
∷	\diamonddots	−	\minus	∨	\vee
÷	\div	∸	\minusdot	⩒	\veedot
·∣	\dotmedvert	∓	\mp	⧓	\vertbowtie
∸	\dotminus	⟃	\neswbipropto	·∣·	\vertdiv
⩎	\doublecap	⟄	\nwsebipropto	∧	\wedge
⩏	\doublecup	+	\plus	⩕	\wedgedot
⩟	\doublecurlyvee	±	\pm	≀	\wreath
⩚	\doublecurlywedge	⌝	\righthalfcap		
⩍	\doublesqcap	⌟	\righthalfcup		

MnSymbol defines \setminus and \smallsetminus as synonyms for \medbackslash; \Join as a synonym for \bowtie; \wr as a synonym for \wreath; \shortmid as a synonym for \medvert; \Cap as a synonym for \doublecap; \Cup as a synonym for \doublecup; and, \uplus as a synonym for \cupplus.

Table 47: mathdesign Binary Operators

⧢	\dtimes	⧖	\udtimes	⧗	\utimes

The mathdesign package additionally provides versions of each of the binary operators shown in Table 41 on page 22.

Table 48: cmll Binary Operators

⅋	\parr	&	\with*

* \with differs from "&" in terms of its math-mode spacing: $A \& B$ produces "$A\&B$", for example, while $A \with B$ produces "$A \& B$".

Table 49: ulsy Geometric Binary Operators

⊜	\odplus

Table 50: mathabx Geometric Binary Operators

▾	\blacktriangledown	⊞	\boxright	⊖	\ominus
◂	\blacktriangleleft	⊡	\boxslash	⊕	\oplus
▸	\blacktriangleright	⊠	\boxtimes	⊜	\oright
▴	\blacktriangleup	⊟	\boxtop	⊘	\oslash
⊛	\boxasterisk	⊿	\boxtriangleup	⊗	\otimes
⧅	\boxbackslash	□	\boxvoid	⊝	\otop
⊟	\boxbot	⊛	\oasterisk	⊿	\otriangleup
⊡	\boxcirc	⦸	\obackslash	○	\ovoid
⊛	\boxcoasterisk	⊝	\obot	▿	\smalltriangledown
⊞	\boxdiv	⊙	\ocirc	◃	\smalltriangleleft
⊡	\boxdot	⊛	\ocoasterisk	▹	\smalltriangleright
⊞	\boxleft	⊜	\odiv	▵	\smalltriangleup
⊟	\boxminus	⊙	\odot		
⊞	\boxplus	⊝	\oleft		

Table 51: MnSymbol Geometric Binary Operators

⧅	\boxbackslash	▼	\filledmedtriangledown	◎	\ocirc
⧈	\boxbox	◀	\filledmedtriangleleft	⊙	\odot
⊡	\boxdot	▶	\filledmedtriangleright	⊖	\ominus
⊟	\boxminus	▲	\filledmedtriangleup	⊕	\oplus
⊞	\boxplus	■	\filledsquare	⊘	\oslash
⧄	\boxslash	★	\filledstar	⊛	\ostar
⊠	\boxtimes	▾	\filledtriangledown	⊗	\otimes
◫	\boxvert	◂	\filledtriangleleft	⟁	\otriangle
◇	\diamondbackslash	▸	\filledtriangleright	⦶	\overt
◈	\diamonddiamond	▴	\filledtriangleup	✯	\pentagram
⋄	\diamonddot	◇	\meddiamond	⋄	\smalldiamond
⟐	\diamondminus	□	\medsquare	▫	\smallsquare
⟡	\diamondplus	☆	\medstar	⋆	\smallstar
⧄	\diamondslash	▽	\medtriangledown	▿	\smalltriangledown
⧆	\diamondtimes	◁	\medtriangleleft	◃	\smalltriangleleft
⧋	\diamondvert	▷	\medtriangleright	▹	\smalltriangleright
▽	\downslice	△	\medtriangleup	▵	\smalltriangleup
◆	\filleddiamond	⊛	\oast	⋆	\thinstar
■	\filledmedsquare	⦸	\obackslash	△	\upslice

MnSymbol defines \blacksquare as a synonym for \filledmedsquare; \square and \Box as synonyms for \medsquare; \diamond as a synonym for \smalldiamond; \Diamond as a synonym for \meddiamond; \star as a synonym for \thinstar; \circledast as a synonym for \oast; \circledcirc as a synonym for \ocirc; and, \circleddash as a synonym for \ominus.

Table 52: Variable-sized Math Operators

$\bigcap$	`\bigcap`	$\bigotimes$	`\bigotimes`	$\bigwedge$	`\bigwedge`	$\prod$	`\prod`
$\bigcup$	`\bigcup`	$\bigsqcup$	`\bigsqcup`	$\coprod$	`\coprod`	$\sum$	`\sum`
$\bigodot$	`\bigodot`	$\biguplus$	`\biguplus`	$\int$	`\int`		
$\bigoplus$	`\bigoplus`	$\bigvee$	`\bigvee`	$\oint$	`\oint`		

Table 53: $\mathcal{AMS}$ Variable-sized Math Operators

$\iint$	`\iint`	$\iiint$	`\iiint`
$\iiiint$	`\iiiint`	$\int\cdots\int$	`\idotsint`

Table 54: stmaryrd Variable-sized Math Operators

$\boxbig$	`\bigbox`	$\biginterleave$	`\biginterleave`	$\bigsqcap$	`\bigsqcap`
$\bigcurlyvee$	`\bigcurlyvee`	$\bignplus$	`\bignplus`	$\bigtriangledown$	`\bigtriangledown`
$\bigcurlywedge$	`\bigcurlywedge`	$\bigparallel$	`\bigparallel`	$\bigtriangleup$	`\bigtriangleup`

Table 55: wasysym Variable-sized Math Operators

$\int\!\!\int$	`\int`†	$\iint$	`\iint`	$\iiint$	`\iiint`
$\int\!\!\int$	`\varint`*	$\oint$	`\varoint`*	$\oiint$	`\oiint`

None of the preceding symbols are defined when wasysym is passed the nointegrals option.

* Not defined when wasysym is passed the integrals option.

† Defined only when wasysym is passed the integrals option. Otherwise, the default LaTeX `\int` glyph (as shown in Table 52) is used.

TABLE 56: mathabx Variable-sized Math Operators

	\bigcurlyvee		\bigboxslash		\bigoright
	\bigsqcap		\bigboxtimes		\bigoslash
	\bigcurlywedge		\bigboxtop		\bigotop
	\bigboxasterisk		\bigboxtriangleup		\bigotriangleup
	\bigboxbackslash		\bigboxvoid		\bigovoid
	\bigboxbot		\bigcomplementop		\bigplus
	\bigboxcirc		\bigoasterisk		\bigsquplus
	\bigboxcoasterisk		\bigobackslash		\bigtimes
	\bigboxdiv		\bigobot		\iiint
	\bigboxdot		\bigocirc		\iint
	\bigboxleft		\bigocoasterisk		\int
	\bigboxminus		\bigodiv		\oiint
	\bigboxplus		\bigoleft		\oint
	\bigboxright		\bigominus		

TABLE 57: txfonts/pxfonts Variable-sized Math Operators

$\boxplus$	$\bigboxplus$	\bigsqcapplus	$\oint\!\!\!\circlearrowleft$	$\oint\!\!\!\circlearrowleft$	\ointclockwise
$\boxplus$	$\bigboxplus$	\bigsqcupplus	$\oint\!\!\!\circlearrowleft$	$\oint\!\!\!\circlearrowleft$	\ointctrclockwise
$\fint$	$\fint$	\fint	$\iiiint\!\!\square$	$\iiiint\!\!\square$	\sqiiint
$\int\cdots\int$	$\int\cdots\int$	\idotsint	$\iint\!\!\square$	$\iint\!\!\square$	\sqiint
$\iiiint$	$\iiiint$	\iiiint	$\int\!\!\square$	$\int\!\!\square$	\sqint
$\iiint$	$\iiint$	\iiint	$\iiint\!\!\circlearrowright$	$\iiint\!\!\circlearrowright$	\varoiiintclockwise
$\iint$	$\iint$	\iint	$\iiint\!\!\circlearrowleft$	$\iiint\!\!\circlearrowleft$	\varoiiintctrclockwise
$\oiiint$	$\oiiint$	\oiiintclockwise	$\iint\!\!\circlearrowright$	$\iint\!\!\circlearrowright$	\varoiintclockwise
$\oiiint$	$\oiiint$	\oiiintctrclockwise	$\iint\!\!\circlearrowleft$	$\iint\!\!\circlearrowleft$	\varoiintctrclockwise
$\oiiint$	$\oiiint$	\oiiint	$\oint\!\!\circlearrowright$	$\oint\!\!\circlearrowright$	\varointclockwise
$\oiint$	$\oiint$	\oiintclockwise	$\oint\!\!\circlearrowleft$	$\oint\!\!\circlearrowleft$	\varointctrclockwise
$\oiint$	$\oiint$	\oiintctrclockwise	$\times$	$\bigtimes$	\varprod
$\oiint$	$\oiint$	\oiint			

TABLE 58: esint Variable-sized Math Operators

$\int\cdots\int$	$\dotsint$		$\oint\!\!\!\!\bigcirc$	$\ointclockwise$	
$\fint$	$\fint$		$\oint\!\!\!\!\circlearrowright$	$\ointctrclockwise$	
$\int\!\!\int\!\!\int\!\!\int$	$\iiiint$		$\oint\!\!\!\!\square$	$\sqiint$	
$\int\!\!\int\!\!\int$	$\iiint$		$\int\!\!\!\!\square$	$\sqint$	
$\int\!\!\int$	$\iint$		$\oint\!\!\!\!\bigcirc$	$\varoiint$	
$\int\!\!\!\!\downarrow$	$\landdownint$		$\oint\!\!\!\!\circlearrowright$	$\varointclockwise$	
$\int\!\!\!\!\uparrow$	$\landupint$		$\oint\!\!\!\!\circlearrowleft$	$\varointctrclockwise$	
$\oint\!\!\!\!\bigcirc$	$\oiint$				

TABLE 59: MnSymbol Variable-sized Math Operators

$\bigcap$	$\bigcap$	\bigcap	$\bigominus$	$\bigominus$	\bigominus	$\complement$	$\complement$	\complement
$\bigcapdot$	$\bigcapdot$	\bigcapdot	$\bigoplus$	$\bigoplus$	\bigoplus	$\coprod$	$\coprod$	\coprod
$\bigcapplus$	$\bigcapplus$	\bigcapplus	$\bigoslash$	$\bigoslash$	\bigoslash	$\int\cdots\int$	$\int\cdots\int$	\idotsint
$\bigcirc$	$\bigcirc$	\bigcircle	$\bigostar$	$\bigostar$	\bigostar	$\iiiii$	$\iiiii$	\iiiint
$\bigcup$	$\bigcup$	\bigcup	$\bigotimes$	$\bigotimes$	\bigotimes	$\iiii$	$\iiii$	\iiint
$\bigcupdot$	$\bigcupdot$	\bigcupdot	$\bigotriangle$	$\bigotriangle$	\bigotriangle	$\iint$	$\iint$	\iint
$\bigcupplus$	$\bigcupplus$	\bigcupplus*	$\bigovert$	$\bigovert$	\bigovert	$\int$	$\int$	\int
$\bigcurlyvee$	$\bigcurlyvee$	\bigcurlyvee	$\bigplus$	$\bigplus$	\bigplus	$\landdownint$	$\landdownint$	\landdownint
$\bigcurlyveedot$	$\bigcurlyveedot$	\bigcurlyveedot	$\bigsqcap$	$\bigsqcap$	\bigsqcap	$\landupint$	$\landupint$	\landupint
$\bigcurlywedge$	$\bigcurlywedge$	\bigcurlywedge	$\bigsqcapdot$	$\bigsqcapdot$	\bigsqcapdot	$\lcircleleftint$	$\lcircleleftint$	\lcircleleftint
$\bigcurlywedgedot$	$\bigcurlywedgedot$	\bigcurlywedgedot	$\bigsqcapplus$	$\bigsqcapplus$	\bigsqcapplus	$\lcirclerightint$	$\lcirclerightint$	\lcirclerightint
$\bigdoublecurlyvee$	$\bigdoublecurlyvee$	\bigdoublecurlyvee	$\bigsqcup$	$\bigsqcup$	\bigsqcup	$\oiint$	$\oiint$	\oiint
$\bigdoublecurlywedge$	$\bigdoublecurlywedge$	\bigdoublecurlywedge	$\bigsqcupdot$	$\bigsqcupdot$	\bigsqcupdot	$\oint$	$\oint$	\oint
$\bigdoublevee$	$\bigdoublevee$	\bigdoublevee	$\bigsqcupplus$	$\bigsqcupplus$	\bigsqcupplus	$\prod$	$\prod$	\prod
$\bigdoublewedge$	$\bigdoublewedge$	\bigdoublewedge	$\bigtimes$	$\bigtimes$	\bigtimes	$\rcircleleftint$	$\rcircleleftint$	\rcircleleftint
$\bigoast$	$\bigoast$	\bigoast	$\bigvee$	$\bigvee$	\bigvee	$\rcirclerightint$	$\rcirclerightint$	\rcirclerightint
$\bigobackslash$	$\bigobackslash$	\bigobackslash	$\bigveedot$	$\bigveedot$	\bigveedot	$\strokedint$	$\strokedint$	\strokedint
$\bigocirc$	$\bigocirc$	\bigocirc	$\bigwedge$	$\bigwedge$	\bigwedge	$\sum$	$\sum$	\sum
$\bigodot$	$\bigodot$	\bigodot	$\bigwedgedot$	$\bigwedgedot$	\bigwedgedot	$\sumint$	$\sumint$	\sumint

* MnSymbol defines \biguplus as a synonym for \bigcupplus.

TABLE 60: mathdesign Variable-sized Math Operators

$\fint$	$\fint$	\intclockwise	$\oint$	$\oint$	\ointclockwise
$\iiiint$	$\iiiint$	\oiiint	$\oint$	$\oint$	\ointctrclockwise
$\iint$	$\iint$	\oiint			

The mathdesign package provides three versions of each integral—in fact, of every symbol—to accompany different text fonts: Utopia ($\int$), Garamond ($\int$), and Charter ($\int$).

TABLE 61: cmll Large Math Operators

$\parr$	\bigparr	$\with$	\bigwith

TABLE 62: Binary Relations

$\approx$	\approx	$\equiv$	\equiv	$\perp$	\perp	$\smile$	\smile
$\asymp$	\asymp	$\frown$	\frown	$\prec$	\prec	$\succ$	\succ
$\bowtie$	\bowtie	$\bowtie$	\Join*	$\preceq$	\preceq	$\succeq$	\succeq
$\cong$	\cong	$\mid$	\mid	$\propto$	\propto	$\vdash$	\vdash
$\dashv$	\dashv	$\models$	\models	$\sim$	\sim		
$\doteq$	\doteq	$\parallel$	\parallel	$\simeq$	\simeq		

* Not predefined in LaTeX 2_ε. Use one of the packages latexsym, amsfonts, amssymb, mathabx, txfonts, pxfonts, or wasysym.

TABLE 63: $\mathcal{AMS}$ Binary Relations

$\approxeq$	\approxeq	$\eqcirc$	\eqcirc	$\succapprox$	\succapprox
$\backepsilon$	\backepsilon	$\fallingdotseq$	\fallingdotseq	$\succcurlyeq$	\succcurlyeq
$\backsim$	\backsim	$\multimap$	\multimap	$\succsim$	\succsim
$\backsimeq$	\backsimeq	$\pitchfork$	\pitchfork	$\therefore$	\therefore
$\because$	\because	$\precapprox$	\precapprox	$\thickapprox$	\thickapprox
$\between$	\between	$\preccurlyeq$	\preccurlyeq	$\thicksim$	\thicksim
$\Bumpeq$	\Bumpeq	$\precsim$	\precsim	$\varpropto$	\varpropto
$\bumpeq$	\bumpeq	$\risingdotseq$	\risingdotseq	$\Vdash$	\Vdash
$\circeq$	\circeq	$\shortmid$	\shortmid	$\vDash$	\vDash
$\curlyeqprec$	\curlyeqprec	$\shortparallel$	\shortparallel	$\Vvdash$	\Vvdash
$\curlyeqsucc$	\curlyeqsucc	$\smallfrown$	\smallfrown		
$\doteqdot$	\doteqdot	$\smallsmile$	\smallsmile		

TABLE 64: $\mathcal{AMS}$ Negated Binary Relations

≇	\ncong	∦	\nshortparallel	⊯	\nVDash
∤	\nmid	≁	\nsim	⪺	\precnapprox
∦	\nparallel	⊁	\nsucc	⋨	\precnsim
⊀	\nprec	⋡	\nsucceq	⪼	\succnapprox
⋠	\npreceq	⊭	\nvDash	⋩	\succnsim
∤	\nshortmid	⊬	\nvdash		

TABLE 65: stmaryrd Binary Relations

⋵	\inplus	⋹	\niplus

TABLE 66: wasysym Binary Relations

⌐	\invneg	⇝	\leadsto	∝	\wasypropto
⋈	\Join	⊛	\logof		

TABLE 67: txfonts/pxfonts Binary Relations

⊘	\circledgtr	⋉	\lJoin	×	\opentimes
⊖	\circledless	⋈	\lrtimes	⫫	\Perp
:≈	\colonapprox	⊸	\multimap	⪵	\preceqq
::≈	\Colonapprox	⊶	\multimapboth	⪹	\precneqq
:−	\coloneq	⧟	\multimapbothvert	⋊	\rJoin
::−	\Coloneq	⧟	\multimapdot	⥽	\strictfi
::=	\Coloneqq	⧟	\multimapdotboth	⥼	\strictif
:=	\coloneqq*	⧟	\multimapdotbothA	⥾	\strictiff
::∼	\Colonsim	⧟	\multimapdotbothAvert	⪶	\succeqq
:∼	\colonsim	⧟	\multimapdotbothB	⪺	\succneqq
−::	\Eqcolon	⧟	\multimapdotbothBvert	//	\varparallel
−:	\eqcolon	⧟	\multimapdotbothvert	\\	\varparallelinv
=:	\eqqcolon	⧟	\multimapdotinv	⫦	\VvDash
=::	\Eqqcolon	⧟	\multimapinv		
≂	\eqsim	×	\openJoin		

* As an alternative to using txfonts/pxfonts, a ":=" symbol can be constructed with "\mathrel{\mathop:}=".

TABLE 68: txfonts/pxfonts Negated Binary Relations

≋	\napproxeq	⋞	\npreccurlyeq	≉	\nthickapprox
≁	\nasymp	⋠	\npreceqq	↞	\ntwoheadleftarrow
∽	\nbacksim	⊀	\nprecsim	↠	\ntwoheadrightarrow
≋	\nbacksimeq	≠	\nsimeq	∦	\nvarparallel
≠	\nbumpeq	⋡	\nsuccapprox	∤	\nvarparallelinv
≠	\nBumpeq	⋟	\nsucccurlyeq	⊮	\nVdash
≢	\nequiv	⋣	\nsucceqq		
⋍	\nprecapprox	⋡	\nsuccsim		

TABLE 69: mathabx Binary Relations

≬	\between	∣	\divides	≒	\risingdotseq
≒	\botdoteq	≒	\dotseq	≿	\succapprox
≎	\Bumpedeq	≑	\eqbumped	≽	\succcurlyeq
≏	\bumpedeq	≖	\eqcirc	≻	\succdot
≗	\circeq	≕	\eqcolon	≿	\succsim
≔	\coloneq	≒	\fallingdotseq	∴	\therefore
≙	\corresponds	⋙	\ggcurly	≐	\topdoteq
⋞	\curlyeqprec	⋘	\llcurly	⊨	\vDash
⋟	\curlyeqsucc	≾	\precapprox	⊩	\Vdash
⫴	\DashV	≼	\preccurlyeq	⊫	\VDash
⫤	\Dashv	≺	\precdot	⊪	\Vvdash
⫣	\dashVv	≾	\precsim		

TABLE 70: mathabx Negated Binary Relations

≉	\napprox	⊥	\notperp	⊭	\nvDash
≇	\ncong	⊀	\nprec	⊯	\nVDash
⋞	\ncurlyeqprec	⋨	\nprecapprox	⊯	\nVdash
⋟	\ncurlyeqsucc	⋠	\npreccurlyeq	⊬	\nvdash
⊯	\nDashv	⋦	\npreceq	⊮	\nVvash
⊮	\ndashV	⋨	\nprecsim	⋨	\precnapprox
⊬	\ndashv	⊁	\nsim	⪹	\precneq
⊯	\nDashV	≄	\nsimeq	⋨	\precnsim
⊮	\ndashVv	⊁	\nsucc	⋩	\succnapprox
≠	\neq	⋩	\nsuccapprox	⪺	\succneq
≁	\notasymp	⋭	\nsucccurlyeq	⋩	\succnsim
∤	\notdivides	⋧	\nsucceq		
≢	\notequiv	⋩	\nsuccsim		

The \changenotsign command toggles the behavior of \not to produce either a vertical or a diagonal slash through a binary operator. Thus, "$a \not= b$" can be made to produce either "$a \neq b$" or "$a \neq b$".

Table 71: MnSymbol Binary Relations

≈	\approx	≑	\eqcirc	↖	\nwfree	∥	\shortparallel
≊	\approxeq	≒	\eqdot	↖	\nwmodels	∼	\sim
⋍	\backapprox	≂	\eqsim	⇖	\nwModels	≃	\simeq
⋍	\backapproxeq	=	\equal	⤫	\nwsecrossing	≻	\succ
≌	\backcong	⧈	\equalclosed	⧹	\nwseline	≿	\succapprox
⋍	\backeqsim	≡	\equiv	⧹	\Nwseline	≽	\succcurlyeq
∽	\backsim	⧈	\equivclosed	↘	\nwvdash	≥	\succeq
≌	\backsimeq	≒	\fallingdotseq	⇘	\nwVdash	≳	\succsim
⋍	\backtriplesim	≙	\hateq	≺	\prec	↙	\swfootline
≬	\between	⋌	\hcrossing	≾	\precapprox	↙	\swfree
≏	\bumpeq	⊢	\leftfootline	≼	\preccurlyeq	↗	\swmodels
≎	\Bumpeq	←	\leftfree	≤	\preceq	⇗	\swModels
≗	\circeq	⫤	\leftmodels	≾	\precsim	↗	\swvdash
⊟	\closedequal	⫤	\leftModels	⊣	\rightfootline	↗	\swVdash
≺	\closedprec	∝	\leftpropto	→	\rightfree	≋	\triplesim
≻	\closedsucc	—	\leftrightline	⊨	\rightmodels	|	\updownline
≅	\cong	═	\Leftrightline	⊫	\rightModels	‖	\Updownline
⋞	\curlyeqprec	◁	\leftslice	∝	\rightpropto	⊺	\upfootline
⋟	\curlyeqsucc	⊣	\leftvdash	▷	\rightslice	↑	\upfree
≐	\doteq	⫤	\leftVdash	⊢	\rightvdash	⫫	\upmodels
≑	\Doteq	↗	\nefootline	⊩	\rightVdash	⫫	\upModels
⎣	\downfootline	↗	\nefree	≒	\risingdotseq	∝	\uppropto
↓	\downfree	⇙	\nemodels	↘	\sefootline	⊥	\upvdash
⫪	\downmodels	⇙	\neModels	↘	\sefree	⫠	\upVdash
⫫	\downModels	⧸	\neswline	⇘	\semodels	⋌	\vcrossing
∝	\downpropto	⧸	\Neswline	⇘	\seModels	⊪	\Vvdash
⊤	\downvdash	↙	\nevdash	)(	\separated		
⫟	\downVdash	⇙	\neVdash	↘	\sevdash		
≒	\eqbump	↖	\nwfootline	⇘	\seVdash		

MnSymbol additionally defines synonyms for some of the preceding symbols:

⊣	\dashv	(same as \leftvdash)
⧹	\diagdown	(same as \nwseline)
⧸	\diagup	(same as \neswline)
⧸	\divides	(same as \updownline)
≑	\doteqdot	(same as \Doteq)
⊨	\models	(same as \rightmodels)
‖	\parallel	(same as \Updownline)
⊥	\perp	(same as \upvdash)
∝	\propto	(same as \leftpropto)
—	\relbar	(same as \leftrightline)
═	\Relbar	(same as \Leftrightline)
∝	\varpropto	(same as \leftpropto)
⊨	\vDash	(same as \rightmodels)
⊫	\VDash	(same as \rightModels)
⊢	\vdash	(same as \rightvdash)
⊩	\Vdash	(same as \rightVdash)

TABLE 72: MnSymbol Negated Binary Relations

$\not\approx$	\napprox	$\not\sim$	\neqsim	$\not\Lleftarrow$	\nnwModels	$\not\succ$	\nsucc
$\not\approxeq$	\napproxeq	$\not=$	\nequal	$\not\nwarrow$	\nnwseline	$\not\succapprox$	\nsuccapprox
$\not\backapprox$	\nbackapprox	$\not\Bumpeq$	\nequalclosed	$\not\NWarrow$	\nNwseline	$\not\succcurlyeq$	\nsuccurlyeq
$\not\backapproxeq$	\nbackapproxeq	$\not\equiv$	\nequiv	$\not\Lsh$	\nnwvdash	$\not\succeq$	\nsucceq
$\not\backcong$	\nbackcong	$\not\Doteq$	\nequivclosed	$\not\Lleftarrow$	\nnwVdash	$\not\succsim$	\nsuccsim
$\not\backeqsim$	\nbackeqsim	$\not\pitchfork$	\neswcrossing	$\not\prec$	\nprec	$\not\swarrow$	\nswfootline
$\not\backsim$	\nbacksim	$\not\fallingdotseq$	\nfallingdotseq	$\not\precapprox$	\nprecapprox	$\not\swarrow$	\nswfree
$\not\backsimeq$	\nbacksimeq	$\not\eqcirc$	\nhateq	$\not\preccurlyeq$	\npreccurlyeq	$\not\swarrow$	\nswmodels
$\not\backtriplesim$	\nbacktriplesim	$\not\leftarrowtail$	\nleftfootline	$\not\preceq$	\npreceq	$\not\Lleftarrow$	\nswModels
$\not\bumpeq$	\nbumpeq	$\not\hookleftarrow$	\nleftfree	$\not\precsim$	\nprecsim	$\not\swarrow$	\nswvdash
$\not\Bumpeq$	\nBumpeq	$\not\dashv$	\nleftmodels	$\not\rightarrowtail$	\nrightfootline	$\not\Lleftarrow$	\nswVdash
$\not\circeq$	\ncirceq	$\not\dashv\!\!\mid$	\nleftModels	$\not\rightarrowtail$	\nrightfree	$\not\approx$	\ntriplesim
$\not\closedequal$	\nclosedequal	$\not-$	\nleftrightline	$\not\models$	\nrightmodels	$\not\mid$	\nupdownline
$\not\cong$	\ncong	$\not=$	\nLeftrightline	$\not\models\!\!\mid$	\nrightModels	$\not\parallel$	\nUpdownline
$\not\curlyeqprec$	\ncurlyeqprec	$\not\dashv$	\nleftvdash	$\not\vdash$	\nrightvdash	$\not\perp$	\nupfootline
$\not\curlyeqsucc$	\ncurlyeqsucc	$\not\dashv\!\!\mid$	\nleftVdash	$\not\models\!\!\mid$	\nrightVdash	$\not\perp$	\nupfree
$\not\doteq$	\ndoteq	$\not\nearrow$	\nnefootline	$\not\risingdotseq$	\nrisingdotseq	$\not\perp$	\nupmodels
$\not\Doteq$	\nDoteq	$\not\nearrow$	\nnefree	$\not\searrow$	\nsefootline	$\not\perp$	\nupModels
$\not\downfootline$	\ndownfootline	$\not\Lleftarrow$	\nnemodels	$\not\searrow$	\nsefree	$\not\perp$	\nupvdash
$\not\downfree$	\ndownfree	$\not\Lleftarrow$	\nneModels	$\not\Lleftarrow$	\nsemodels	$\not\perp$	\nupVdash
$\not\downmodels$	\ndownmodels	$\not\nearrow$	\nneswline	$\not\Lleftarrow$	\nseModels	$\not\precapprox$	\precnapprox
$\not\downModels$	\ndownModels	$\not\nearrow$	\nNeswline	$\not\Lsh$	\nsevdash	$\not\precsim$	\precnsim
$\not\downvdash$	\ndownvdash	$\not\nearrow$	\nnevdash	$\not\Lsh$	\nseVdash	$\not\succapprox$	\succnapprox
$\not\downVdash$	\ndownVdash	$\not\nearrow$	\nneVdash	$\not\shortmid$	\nshortmid	$\not\succsim$	\succnsim
$\not\eqbump$	\neqbump	$\not\nwarrow$	\nnwfootline	$\not\shortparallel$	\nshortparallel		
$\not\eqcirc$	\neqcirc	$\not\nwarrow$	\nnwfree	$\not\sim$	\nsim		
$\not\eqdot$	\neqdot	$\not\Lleftarrow$	\nnwmodels	$\not\simeq$	\nsimeq		

MnSymbol additionally defines synonyms for some of the preceding symbols:

$\not\dashv$	\ndashv	(same as \nleftvdash)
$\not\diagdown$	\ndiagdown	(same as \nnwseline)
$\not\diagup$	\ndiagup	(same as \nneswline)
$\not\mid$	\ndivides	(same as \nupdownline)
$\not=$	\ne	(same as \nequal)
$\not=$	\neq	(same as \nequal)
$\not\mid$	\nmid	(same as \nupdownline)
$\not\models$	\nmodels	(same as \nrightmodels)
$\not\parallel$	\nparallel	(same as \nUpdownline)
$\not\perp$	\nperp	(same as \nupvdash)
$\not-$	\nrelbar	(same as \nleftrightline)
$\not=$	\nRelbar	(same as \nLeftrightline)
$\not\models$	\nvDash	(same as \nrightmodels)
$\not\vdash$	\nvdash	(same as \nrightvdash)
$\not\models\!\!\mid$	\nVdash	(same as \nrightVdash)
$\not\models\!\!\mid\!\!=$	\nVDash	(same as \nrightModels)

Table 73: mathtools Binary Relations

::≈	\Colonapprox	:−	\coloneq	−::	\Eqcolon
:≈	\colonapprox	:∼	\colonsim	=:	\eqqcolon
:=	\coloneqq	::∼	\Colonsim	=::	\Eqqcolon
::=	\Coloneqq	::	\dblcolon		
::−	\Coloneq	−:	\eqcolon		

Similar symbols can be defined using mathtools's `\vcentcolon`, which produces a colon centered on the font's math axis:

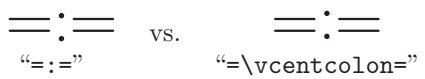

Table 74: turnstile Binary Relations

$\left\Vert\frac{def}{abc}\right\Vert$	\dddtstile{abc}{def}	$\frac{def}{abc}$	\nntstile{abc}{def}	$\left\vert\frac{def}{abc}\right\Vert$	\stdtstile{abc}{def}
$\left\Vert\frac{def}{abc}\right\vert$	\ddststile{abc}{def}	$\frac{def}{abc}\vert\vert\vert$	\nnttstile{abc}{def}	$\left\vert\frac{def}{abc}\right\vert$	\stststile{abc}{def}
$\left\Vert\frac{def}{abc}\right.$	\ddtstile{abc}{def}	$\frac{def}{abc}\Vert$	\nsdtstile{abc}{def}	$\left\vert\frac{def}{abc}\right.$	\sttstile{abc}{def}
$\left\Vert\frac{def}{abc}\right\vert\vert$	\ddttstile{abc}{def}	$\frac{def}{abc}\vert$	\nsststile{abc}{def}	$\left\vert\frac{def}{abc}\right\vert\vert$	\stttstile{abc}{def}
$\Vert\frac{def}{abc}\Vert$	\dndtstile{abc}{def}	$\frac{def}{abc}$	\nststile{abc}{def}	$\vert\Vert\frac{def}{abc}\Vert$	\tddtstile{abc}{def}
$\Vert\frac{def}{abc}\vert$	\dnststile{abc}{def}	$\frac{def}{abc}\vert\vert\vert$	\nsttstile{abc}{def}	$\vert\Vert\frac{def}{abc}\vert$	\tdststile{abc}{def}
$\Vert\frac{def}{abc}$	\dntstile{abc}{def}	$\frac{def}{abc}\Vert$	\ntdtstile{abc}{def}	$\vert\Vert\frac{def}{abc}$	\tdtstile{abc}{def}
$\Vert\frac{def}{abc}\vert\vert\vert$	\dnttstile{abc}{def}	$\frac{def}{abc}\vert$	\ntststile{abc}{def}	$\vert\Vert\frac{def}{abc}\vert\vert\vert$	\tdttstile{abc}{def}
$\left\Vert\frac{def}{abc}\right\Vert$	\dsdtstile{abc}{def}	$\frac{def}{abc}$	\nttstile{abc}{def}	$\vert\vert\vert\frac{def}{abc}\Vert$	\tndtstile{abc}{def}
$\left\Vert\frac{def}{abc}\right\vert$	\dsststile{abc}{def}	$\frac{def}{abc}\vert\vert\vert$	\ntttstile{abc}{def}	$\vert\vert\vert\frac{def}{abc}\vert$	\tnststile{abc}{def}
$\left\Vert\frac{def}{abc}\right.$	\dststile{abc}{def}	$\left\vert\frac{def}{abc}\right\Vert$	\sddtstile{abc}{def}	$\vert\vert\vert\frac{def}{abc}$	\tntstile{abc}{def}
$\left\Vert\frac{def}{abc}\right\vert\vert\vert$	\dsttstile{abc}{def}	$\left\vert\frac{def}{abc}\right\vert$	\sdststile{abc}{def}	$\vert\vert\vert\frac{def}{abc}\vert\vert\vert$	\tnttstile{abc}{def}
$\left\Vert\frac{def}{abc}\right\Vert$	\dtdtstile{abc}{def}	$\left\vert\frac{def}{abc}\right.$	\sdtstile{abc}{def}	$\vert\vert\vert\frac{def}{abc}\Vert$	\tsdtstile{abc}{def}
$\left\Vert\frac{def}{abc}\right\vert$	\dtststile{abc}{def}	$\left\vert\frac{def}{abc}\right\vert\vert$	\sdttstile{abc}{def}	$\vert\vert\vert\frac{def}{abc}\vert$	\tsststile{abc}{def}
$\left\Vert\frac{def}{abc}\right.$	\dttstile{abc}{def}	$\vert\frac{def}{abc}\Vert$	\sndtstile{abc}{def}	$\vert\vert\vert\frac{def}{abc}$	\tststile{abc}{def}

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$\left\Vert\frac{def}{abc}\right\Vert$	`\dtttstile{abc}{def}`	$\left\vert\frac{def}{abc}\right\vert$	`\snststile{abc}{def}`	$\left\Vert\frac{def}{abc}\right\Vert$	`\tsttstile{abc}{def}`
$\frac{def}{abc}\Vert$	`\nddtstile{abc}{def}`	$\left\vert\frac{def}{abc}\right.$	`\sntstile{abc}{def}`	$\left\Vert\frac{def}{abc}\right\Vert$	`\ttdtstile{abc}{def}`
$\frac{def}{abc}\vert$	`\ndststile{abc}{def}`	$\left\vert\frac{def}{abc}\right\Vert$	`\snttstile{abc}{def}`	$\left\Vert\frac{def}{abc}\right\vert$	`\ttststile{abc}{def}`
$\frac{def}{abc}$	`\ndtstile{abc}{def}`	$\left\vert\frac{def}{abc}\right\Vert$	`\ssdtstile{abc}{def}`	$\left\Vert\frac{def}{abc}\right.$	`\tttstile{abc}{def}`
$\frac{def}{abc}\Vert\Vert$	`\ndtttstile{abc}{def}`	$\left\vert\frac{def}{abc}\right\vert$	`\sssttstile{abc}{def}`	$\left\Vert\frac{def}{abc}\right\Vert$	`\ttttstile{abc}{def}`
$\frac{def}{abc}\Vert$	`\nndtstile{abc}{def}`	$\left\vert\frac{def}{abc}\right.$	`\sststile{abc}{def}`		
$\frac{def}{abc}\vert$	`\nnststile{abc}{def}`	$\left\vert\frac{def}{abc}\right\Vert$	`\ssttstile{abc}{def}`		

Each of the above takes an optional argument that controls the size of the upper and lower expressions. See the turnstile documentation for more information.

TABLE 75: trsym Binary Relations

⊷	`\InversTransformHoriz`	⊶	`\TransformHoriz`
⥮	`\InversTransformVert`	⥯	`\TransformVert`

TABLE 76: trfsigns Binary Relations

⏦	`\dfourier`	⏧	`\Dfourier`
⟞	`\fourier`	⟝	`\Fourier`
⧆	`\laplace`	⧇	`\Laplace`
⨟	`\ztransf`	⨠	`\Ztransf`

TABLE 77: cmll Binary Relations

⌔	`\coh`	⌒	`\scoh`
⍀	`\incoh`	⌓	`\sincoh`

TABLE 78: Subset and Superset Relations

⊏	`\sqsubset`*	⊒	`\sqsupseteq`	⊃	`\supset`
⊑	`\sqsubseteq`	⊂	`\subset`	⊇	`\supseteq`
⊐	`\sqsupset`*	⊆	`\subseteq`		

* Not predefined in LaTeX 2ε. Use one of the packages latexsym, amsfonts, amssymb, mathabx, txfonts, pxfonts, or wasysym.

Table 79: $\mathcal{AMS}$ Subset and Superset Relations

$\nsubseteq$	\nsubseteq	$\subseteqq$	\subseteqq	$\supsetneqq$	\supsetneqq
$\nsupseteq$	\nsupseteq	$\subsetneq$	\subsetneq	$\varsubsetneq$	\varsubsetneq
$\nsupseteqq$	\nsupseteqq	$\subsetneqq$	\subsetneqq	$\varsubsetneqq$	\varsubsetneqq
$\sqsubset$	\sqsubset	$\Supset$	\Supset	$\varsupsetneq$	\varsupsetneq
$\sqsupset$	\sqsupset	$\supseteqq$	\supseteqq	$\varsupsetneqq$	\varsupsetneqq
$\Subset$	\Subset	$\supsetneq$	\supsetneq		

Table 80: stmaryrd Subset and Superset Relations

$\subsetplus$	\subsetplus	$\supsetplus$	\supsetplus
$\subsetpluseq$	\subsetpluseq	$\supsetpluseq$	\supsetpluseq

Table 81: wasysym Subset and Superset Relations

$\sqsubset$	\sqsubset	$\sqsupset$	\sqsupset

Table 82: txfonts/pxfonts Subset and Superset Relations

$\nsqsubset$	\nsqsubset	$\nsqsupseteq$	\nsqsupseteq	$\nSupset$	\nSupset
$\nsqsubseteq$	\nsqsubseteq	$\nSubset$	\nSubset		
$\nsqsupset$	\nsqsupset	$\subseteqq$	\nsubseteqq		

Table 83: mathabx Subset and Superset Relations

$\nsqsubset$	\nsqsubset	$\nsupset$	\nsupset	$\sqsupseteq$	\sqsupseteq	$\supseteq$	\supseteq
$\nsqSubset$	\nsqSubset	$\nSupset$	\nSupset	$\sqsupseteqq$	\sqsupseteqq	$\supseteqq$	\supseteqq
$\nsqsubseteq$	\nsqsubseteq	$\nsupseteq$	\nsupseteq	$\sqsupsetneq$	\sqsupsetneq	$\supsetneq$	\supsetneq
$\nsqsubseteqq$	\nsqsubseteqq	$\nsupseteqq$	\nsupseteqq	$\sqsupsetneqq$	\sqsupsetneqq	$\supsetneqq$	\supsetneqq
$\nsqsupset$	\nsqsupset	$\sqsubset$	\sqsubset	$\subset$	\subset	$\varsubsetneq$	\varsqsubsetneq
$\nsqSupset$	\nsqSupset	$\sqSubset$	\sqSubset	$\Subset$	\Subset	$\varsubsetneqq$	\varsqsubsetneqq
$\nsqsupseteq$	\nsqsupseteq	$\sqsubseteq$	\sqsubseteq	$\subseteq$	\subseteq	$\varsupsetneq$	\varsqsupsetneq
$\nsqsupseteqq$	\nsqsupseteqq	$\sqsubseteqq$	\sqsubseteqq	$\subseteqq$	\subseteqq	$\varsupsetneqq$	\varsqsupsetneqq
$\nsubset$	\nsubset	$\sqsubsetneq$	\sqsubsetneq	$\subsetneq$	\subsetneq	$\varsubsetneq$	\varsubsetneq
$\nSubset$	\nSubset	$\sqsubsetneqq$	\sqsubsetneqq	$\subsetneqq$	\subsetneqq	$\varsubsetneqq$	\varsubsetneqq
$\nsubseteq$	\nsubseteq	$\sqSupset$	\sqSupset	$\supset$	\supset	$\varsupsetneq$	\varsupsetneq
$\nsubseteqq$	\nsubseteqq	$\sqsupset$	\sqsupset	$\Supset$	\Supset	$\varsupsetneqq$	\varsupsetneqq

TABLE 84: MnSymbol Subset and Superset Relations

⋤	\nSqsubset	⊈	\nsubseteq	⫋	\sqsubsetneq	⊆	\subseteq
⋢	\nsqsubset	⊉	\nsubseteqq	⫌	\sqsubsetneqq	⫅	\subseteqq
⋣	\nsqsubseteq	⫉	\nSupset	⫋	\Sqsupset	⫋	\subsetneq
⫋̸	\nsqsubseteqq	⊅	\nsupset	⊐	\sqsupset	⫌	\subsetneqq
⫉̸	\nSqsupset	⊉	\nsupseteq	⊒	\sqsupseteq	⫗	\Supset
⋢	\nsqsupset	⫆̸	\nsupseteqq	⫆	\sqsupseteqq	⊃	\supset
⋣	\nsqsupseteq	⫋	\Sqsubset	⫋	\sqsupsetneq	⊇	\supseteq
⫆̸	\nsqsupseteqq	⊏	\sqsubset	⫌	\sqsupsetneqq	⫆	\supseteqq
⫋	\nSubset	⊑	\sqsubseteq	⫋	\Subset	⫋	\supsetneq
⊄	\nsubset	⫆	\sqsubseteqq	⊂	\subset	⫌	\supsetneqq

MnSymbol additionally defines \varsubsetneq as a synonym for \subsetneq, \varsubsetneqq as a synonym for \subsetneqq, \varsupsetneq as a synonym for \supsetneq, and \varsupsetneqq as a synonym for \supsetneqq.

TABLE 85: Inequalities

≥	\geq	≫	\gg	≤	\leq	≪	\ll	≠	\neq

TABLE 86: $\mathcal{AMS}$ Inequalities

⩾	\eqslantgtr	⪖	\gtrdot	⋚	\lesseqgtr	≱	\ngeq
⩽	\eqslantless	≷	\gtreqless	⪋	\lesseqqgtr	≱	\ngeqq
≧	\geqq	≷	\gtreqqless	⩽	\lessgtr	⩾̸	\ngeqslant
⩾	\geqslant	≳	\gtrless	≲	\lesssim	≯	\ngtr
⋙	\ggg	≳	\gtrsim	⋘	\lll	≰	\nleq
⪈	\gnapprox	≩	\gvertneqq	⪇	\lnapprox	≰	\nleqq
⪈	\gneq	≦	\leqq	⪇	\lneq	⩽̸	\nleqslant
≩	\gneqq	⩽	\leqslant	≨	\lneqq	≮	\nless
⪊	\gnsim	≲	\lessapprox	⪉	\lnsim		
≳	\gtrapprox	⩿	\lessdot	≨	\lvertneqq		

TABLE 87: wasysym Inequalities

≳	\apprge	≲	\apprle

TABLE 88: txfonts/pxfonts Inequalities

$\ngg$	\ngg	$\ngtrsim$	\ngtrsim	$\nlesssim$	\nlesssim
$\ngtrapprox$	\ngtrapprox	$\nlessapprox$	\nlessapprox	$\nll$	\nll
$\ngtrless$	\ngtrless	$\nlessgtr$	\nlessgtr		

TABLE 89: mathabx Inequalities

$\geqslant$	\eqslantgtr	$\gtreqless$	\gtreqless	$\lesssim$	\lesssim	$\ngtr$	\ngtr
$\leqslant$	\eqslantless	$\gtreqqless$	\gtreqqless	$\ll$	\ll	$\ngtrapprox$	\ngtrapprox
$\geqslant$	\geq	$\gtrless$	\gtrless	$\lll$	\lll	$\ngtrsim$	\ngtrsim
$\geqq$	\geqq	$\gtrsim$	\gtrsim	$\lnapprox$	\lnapprox	$\nleq$	\nleq
$\gg$	\gg	$\gvertneqq$	\gvertneqq	$\lneq$	\lneq	$\nleqq$	\nleqq
$\ggg$	\ggg	$\leqslant$	\leq	$\lneqq$	\lneqq	$\nless$	\nless
$\gnapprox$	\gnapprox	$\leqq$	\leqq	$\lnsim$	\lnsim	$\nlessapprox$	\nlessapprox
$\gneq$	\gneq	$\lessapprox$	\lessapprox	$\lvertneqq$	\lvertneqq	$\nlesssim$	\nlesssim
$\gneqq$	\gneqq	$\lessdot$	\lessdot	$\neqslantgtr$	\neqslantgtr	$\nvargeq$	\nvargeq
$\gnsim$	\gnsim	$\lesseqgtr$	\lesseqgtr	$\neqslantless$	\neqslantless	$\nvarleq$	\nvarleq
$\gtrapprox$	\gtrapprox	$\lesseqqgtr$	\lesseqqgtr	$\ngeq$	\ngeq	$\vargeq$	\vargeq
$\gtrdot$	\gtrdot	$\lessgtr$	\lessgtr	$\ngeqq$	\ngeqq	$\varleq$	\varleq

mathabx defines `\leqslant` and `\le` as synonyms for `\leq`, `\geqslant` and `\ge` as synonyms for `\geq`, `\nleqslant` as a synonym for `\nleq`, and `\ngeqslant` as a synonym for `\ngeq`.

TABLE 90: MnSymbol Inequalities

$\eqslantgtr$	\eqslantgtr	$\gtreqqless$	\gtreqqless	$\lesssim$	\lesssim	$\ngtreqless$	\ngtreqless
$\eqslantless$	\eqslantless	$\gtrless$	\gtrless	$\ll$	\ll	$\ngtreqlessslant$	\ngtreqlessslant
$\geq$	\geq	$\gtrneqqless$	\gtrneqqless	$\lll$	\lll	$\ngtreqqless$	\ngtreqqless
$\trianglerighteq$	\geqclosed	$\gtrsim$	\gtrsim	$\lnapprox$	\lnapprox	$\ngtrless$	\ngtrless
$\geqdot$	\geqdot	$\leq$	\leq	$\lneqq$	\lneqq	$\nleq$	\nleq
$\geqq$	\geqq	$\trianglelefteq$	\leqclosed	$\lnsim$	\lnsim	$\nleqclosed$	\nleqclosed
$\geqslant$	\geqslant	$\leqdot$	\leqdot	$\neqslantgtr$	\neqslantgtr	$\nleqdot$	\nleqdot
$\geqslant$	\geqslantdot	$\leqq$	\leqq	$\neqslantless$	\neqslantless	$\nleqq$	\nleqq
$\gg$	\gg	$\leqslant$	\leqslant	$\ngeq$	\ngeq	$\nleqslant$	\nleqslant
$\ggg$	\ggg	$\leqslantdot$	\leqslantdot	$\ngeqclosed$	\ngeqclosed	$\nleqslantdot$	\nleqslantdot
$\gnapprox$	\gnapprox	$<$	\less	$\ngeqdot$	\ngeqdot	$\nless$	\nless
$\gneqq$	\gneqq	$\lessapprox$	\lessapprox	$\ngeqq$	\ngeqq	$\nlessclosed$	\nlessclosed
$\gnsim$	\gnsim	$\lessclosed$	\lessclosed	$\ngeqslant$	\ngeqslant	$\nlessdot$	\nlessdot
$>$	\gtr	$\lessdot$	\lessdot	$\ngeqslantdot$	\ngeqslantdot	$\nlesseqgtr$	\nlesseqgtr
$\gtrapprox$	\gtrapprox	$\lesseqgtr$	\lesseqgtr	$\ngg$	\ngg	$\nlesseqgtrslant$	\nlesseqgtrslant
$\gtrclosed$	\gtrclosed	$\lesseqgtrslant$	\lesseqgtrslant	$\nggg$	\nggg	$\nlesseqqgtr$	\nlesseqqgtr
$\gtrdot$	\gtrdot	$\lesseqqgtr$	\lesseqqgtr	$\ngtr$	\ngtr	$\nlessgtr$	\nlessgtr
$\gtreqless$	\gtreqless	$\lessgtr$	\lessgtr	$\ngtrclosed$	\ngtrclosed	$\nll$	\nll
$\gtreqlessslant$	\gtreqlessslant	$\lessneqqgtr$	\lessneqqgtr	$\ngtrdot$	\ngtrdot	$\nlll$	\nlll

MnSymbol additionally defines synonyms for some of the preceding symbols:

$\ggg$	\gggtr	(same as \ggg)
$\gneqq$	\gvertneqq	(same as \gneqq)
$\lessclosed$	\lhd	(same as \lessclosed)
$\lll$	\llless	(same as \lll)
$\lneqq$	\lvertneqq	(same as \lneqq)
$\ntrianglelefteq$	\ntriangleleftequal	(same as \nleqclosed)
$\nlessclosed$	\ntriangleleft	(same as \nlessclosed)
$\ntrianglerighteq$	\ntrianglerightequal	(same as \ngeqclosed)
$\ngtrclosed$	\ntriangleright	(same as \ngtrclosed)
$\gtrclosed$	\rhd	(same as \gtrclosed)
$\leqclosed$	\trianglelefteqslant	(same as \leqclosed)
$\geqclosed$	\trianglerighteqslant	(same as \geqclosed)
$\leqclosed$	\unlhd	(same as \leqclosed)
$\geqclosed$	\unrhd	(same as \geqclosed)
$\lessclosed$	\vartriangleleft	(same as \lessclosed)
$\gtrclosed$	\vartriangleright	(same as \gtrclosed)

TABLE 91: $\mathcal{AMS}$ Triangle Relations

$\blacktriangleleft$	\blacktriangleleft	$\ntrianglelefteq$	\ntrianglelefteq	$\trianglelefteq$	\trianglelefteq	$\vartriangleleft$	\vartriangleleft
$\blacktriangleright$	\blacktriangleright	$\ntriangleright$	\ntriangleright	$\triangleq$	\triangleq	$\vartriangleright$	\vartriangleright
$\ntriangleleft$	\ntriangleleft	$\ntrianglerighteq$	\ntrianglerighteq	$\trianglerighteq$	\trianglerighteq		

TABLE 92: stmaryrd Triangle Relations

⧏	\trianglelefteqslant	⧐	\trianglerighteqslant
⧏̸	\ntrianglelefteqslant	⧐̸	\ntrianglerighteqslant

TABLE 93: mathabx Triangle Relations

⋪	\ntriangleleft	⋭	\ntrianglerighteq	⊳	\triangleright	⊳	\vartriangleright
⋬	\ntrianglelefteq	⊲	\triangleleft	⋭	\trianglerighteq		
⋫	\ntriangleright	⋬	\trianglelefteq	⊲	\vartriangleleft		

TABLE 94: MnSymbol Triangle Relations

▼	\filledmedtriangledown	△	\largetriangleup	▿	\smalltriangledown
◀	\filledmedtriangleleft	▽	\medtriangledown	◃	\smalltriangleleft
▶	\filledmedtriangleright	◁	\medtriangleleft	▹	\smalltriangleright
▲	\filledmedtriangleup	▷	\medtriangleright	▵	\smalltriangleup
▾	\filledtriangledown	△	\medtriangleup	≜	\triangleeq
◂	\filledtriangleleft	≠	\ntriangleeq	⊴	\trianglelefteq
▸	\filledtriangleright	⋪	\ntriangleleft	⊵	\trianglerighteq
▴	\filledtriangleup	⋬	\ntrianglelefteq	◁	\vartriangleleft
▽	\largetriangledown	⋫	\ntriangleright	▷	\vartriangleright
◁	\largetriangleleft	⋭	\ntrianglerighteq		
▷	\largetriangleright	⟁	\otriangle		

MnSymbol additionally defines synonyms for many of the preceding symbols: \triangleq is a synonym for \triangleeq; \lhd and \lessclosed are synonyms for \vartriangleleft; \rhd and \gtrclosed are synonyms for \vartriangleright; \unlhd and \leqclosed are synonyms for \trianglelefteq; \unrhd and \geqclosed are synonyms for \trianglerighteq; \blacktriangledown, \blacktriangleleft, \blacktriangleright, and \blacktriangle [*sic*] are synonyms for, respectively, \filledmedtriangledown, \filledmedtriangleleft, \filledmedtriangleright, and \filledmedtriangleup; \triangleright is a synonym for \medtriangleright; \triangle, \vartriangle, and \bigtriangleup are synonyms for \medtriangleup; \triangleleft is a synonym for \medtriangleleft; \triangledown and \bigtriangledown are synonyms for \medtriangledown; \nlessclosed is a synonym for \ntriangleleft; \ngtrclosed is a synonym for \ntriangleright; \nleqclosed is a synonym for \ntrianglelefteq; and \ngeqclosed is a synonym for \ntrianglerighteq.

The title "Triangle Relations" is a bit of a misnomer here as only \triangleeq and \ntriangleeq are defined as TEX relations (class 3 symbols). The \largetriangle... symbols are defined as TEX "ordinary" characters (class 0) and all of the remaining characters are defined as TEX binary operators (class 2).

TABLE 95: Arrows

$\Downarrow$	`\Downarrow`	$\longleftarrow$	`\longleftarrow`	$\nwarrow$	`\nwarrow`
$\downarrow$	`\downarrow`	$\Longleftarrow$	`\Longleftarrow`	$\Rightarrow$	`\Rightarrow`
$\hookleftarrow$	`\hookleftarrow`	$\longleftrightarrow$	`\longleftrightarrow`	$\rightarrow$	`\rightarrow`
$\hookrightarrow$	`\hookrightarrow`	$\Longleftrightarrow$	`\Longleftrightarrow`	$\searrow$	`\searrow`
$\leadsto$	`\leadsto`*	$\longmapsto$	`\longmapsto`	$\swarrow$	`\swarrow`
$\leftarrow$	`\leftarrow`	$\Longrightarrow$	`\Longrightarrow`	$\uparrow$	`\uparrow`
$\Leftarrow$	`\Leftarrow`	$\longrightarrow$	`\longrightarrow`	$\Uparrow$	`\Uparrow`
$\Leftrightarrow$	`\Leftrightarrow`	$\mapsto$	`\mapsto`	$\updownarrow$	`\updownarrow`
$\leftrightarrow$	`\leftrightarrow`	$\nearrow$	`\nearrow`†	$\Updownarrow$	`\Updownarrow`

* Not predefined in LaTeX 2_ε. Use one of the packages latexsym, amsfonts, amssymb, txfonts, pxfonts, or wasysym.

† See the note beneath Table 157 for information about how to put a diagonal arrow across a mathematical expression (as in "$\not\nabla \cdot \vec{B} \overset{0}{\nearrow}$") .

TABLE 96: Harpoons

$\leftharpoondown$	`\leftharpoondown`	$\rightharpoondown$	`\rightharpoondown`	$\rightleftharpoons$	`\rightleftharpoons`
$\leftharpoonup$	`\leftharpoonup`	$\rightharpoonup$	`\rightharpoonup`		

TABLE 97: textcomp Text-mode Arrows

$\downarrow$	`\textdownarrow`	$\rightarrow$	`\textrightarrow`
$\leftarrow$	`\textleftarrow`	$\uparrow$	`\textuparrow`

TABLE 98: $\mathcal{AMS}$ Arrows

$\circlearrowleft$	`\circlearrowleft`	$\leftleftarrows$	`\leftleftarrows`	$\rightleftarrows$	`\rightleftarrows`
$\circlearrowright$	`\circlearrowright`	$\leftrightarrows$	`\leftrightarrows`	$\rightrightarrows$	`\rightrightarrows`
$\curvearrowleft$	`\curvearrowleft`	$\leftrightsquigarrow$	`\leftrightsquigarrow`	$\rightsquigarrow$	`\rightsquigarrow`
$\curvearrowright$	`\curvearrowright`	$\Lleftarrow$	`\Lleftarrow`	$\Rsh$	`\Rsh`
$\dashleftarrow$	`\dashleftarrow`	$\looparrowleft$	`\looparrowleft`	$\twoheadleftarrow$	`\twoheadleftarrow`
$\dashrightarrow$	`\dashrightarrow`	$\looparrowright$	`\looparrowright`	$\twoheadrightarrow$	`\twoheadrightarrow`
$\downdownarrows$	`\downdownarrows`	$\Lsh$	`\Lsh`	$\upuparrows$	`\upuparrows`
$\leftarrowtail$	`\leftarrowtail`	$\rightarrowtail$	`\rightarrowtail`		

TABLE 99: $\mathcal{AMS}$ Negated Arrows

$\nLeftarrow$	`\nLeftarrow`	$\nLeftrightarrow$	`\nLeftrightarrow`	$\nRightarrow$	`\nRightarrow`
$\nleftarrow$	`\nleftarrow`	$\nleftrightarrow$	`\nleftrightarrow`	$\nrightarrow$	`\nrightarrow`

TABLE 100: $\mathcal{AMS}$ Harpoons

⇂	\downharpoonleft	⇋	\leftrightharpoons	↿	\upharpoonleft
⇃	\downharpoonright	⇌	\rightleftharpoons	↾	\upharpoonright

TABLE 101: stmaryrd Arrows

⇽	\leftarrowtriangle	⇐|	\Mapsfrom	←	\shortleftarrow
⇿	\leftrightarroweq	↤	\mapsfrom	→	\shortrightarrow
⇹	\leftrightarrowtriangle	|⇒	\Mapsto	↑	\shortuparrow
↯	\lightning	↗	\nnearrow	↘	\ssearrow
⟸|	\Longmapsfrom	↖	\nnwarrow	↙	\sswarrow
⟻	\longmapsfrom	⇾	\rightarrowtriangle		
|⟹	\Longmapsto	↓	\shortdownarrow		

TABLE 102: txfonts/pxfonts Arrows

⇐⊡	\boxdotLeft	⊙→	\circleddotright	←◇	\Diamondleft
←⊡	\boxdotleft	←○	\circleleft	◇→	\Diamondright
⊡→	\boxdotright	○→	\circleright	◇⇒	\DiamondRight
⊡⇒	\boxdotRight	⇠	\dashleftrightarrow	⇜	\leftsquigarrow
⇐□	\boxLeft	⇐◈	\DiamonddotLeft	⇗	\Nearrow
←□	\boxleft	←◈	\Diamonddotleft	⇖	\Nwarrow
□→	\boxright	◈→	\Diamonddotright	⇛	\Rrightarrow
□⇒	\boxRight	◈⇒	\DiamonddotRight	⇘	\Searrow
←⊙	\circleddotleft	⇐◇	\DiamondLeft	⇙	\Swarrow

TABLE 103: mathabx Arrows

↺	\circlearrowleft	←	\leftarrow	↖	\nwarrow
↻	\circlearrowright	⇇	\leftleftarrows	↾	\restriction
↜	\curvearrowbotleft	↔	\leftrightarrow	→	\rightarrow
↭	\curvearrowbotleftright	⇆	\leftrightarrows	⇄	\rightleftarrows
⤿	\curvearrowbotright	↭	\leftrightsquigarrow	⇉	\rightrightarrows
↶	\curvearrowleft	↜	\leftsquigarrow	⇝	\rightsquigarrow
↷	\curvearrowleftright	↺	\lefttorightarrow	↩	\righttoleftarrow
↷	\curvearrowright	↫	\looparrowdownleft	↱	\Rsh
↲	\dlsh	↬	\looparrowdownright	↘	\searrow
⇊	\downdownarrows	↫	\looparrowleft	↙	\swarrow
↺	\downtouparrow	↬	\looparrowright	↑↓	\updownarrows
↓↑	\downuparrows	↰	\Lsh	∩	\uptodownarrow
↳	\drsh	↗	\nearrow	↑↑	\upuparrows

TABLE 104: mathabx Negated Arrows

⇍	\nLeftarrow	↮	\nleftrightarrow	↛	\nrightarrow
↚	\nleftarrow	⇎	\nLeftrightarrow	⇏	\nRightarrow

Table 105: mathabx Harpoons

⥤	\barleftharpoon	↼	\leftharpoonup	⥋	\rightleftharpoons
⥥	\barrightharpoon	⇇	\leftleftharpoons	⇉	\rightrightharpoons
⥯	\downdownharpoons	⇀	\leftrightharpoon	⥮	\updownharpoons
⇃	\downharpoonleft	⇋	\leftrightharpoons	↿	\upharpoonleft
⇂	\downharpoonright	⥩	\rightbarharpoon	↾	\upharpoonright
⥣	\downupharpoons	⇁	\rightharpoondown	⥉	\upupharpoons
⥢	\leftbarharpoon	⇀	\rightharpoonup		
↽	\leftharpoondown	⇌	\rightleftharpoon		

Table 106: MnSymbol Arrows

⤵	\curvearrowdownup	⟵	\longleftarrow	↙	\rhookswarrow
⥽	\curvearrowleftright	⟸	\Longleftarrow	↾	\rhookuparrow
⤾	\curvearrownesw	⟷	\longleftrightarrow	→	\rightarrow
⤿	\curvearrownwse	⟺	\Longleftrightarrow	⇒	\Rightarrow
⥼	\curvearrowrightleft	⟼	\longmapsto	↣	\rightarrowtail
⤸	\curvearrowsenw	⟶	\longrightarrow	⇄	\rightleftarrows
⤽	\curvearrowswne	⟹	\Longrightarrow	⇝	\rightlsquigarrow
⥻	\curvearrowupdown	↫	\looparrowleft	↦	\rightmapsto
⇣	\dasheddownarrow	↬	\looparrowright	⇉	\rightrightarrows
⇠	\dashedleftarrow	↰	\Lsh	⇝	\rightrsquigarrow
⇗	\dashednearrow	↗	\nearrow	⤇	\Rrightarrow
⇖	\dashednwarrow	⇗	\Nearrow	↱	\Rsh
⇢	\dashedrightarrow	↗	\nearrowtail	↘	\searrow
⇘	\dashedsearrow	↗	\nelsquigarrow	⇘	\Searrow
⇙	\dashedswarrow	↗	\nemapsto	↘	\searrowtail
⇡	\dasheduparrow	⇗	\nenearrows	↘	\selsquigarrow
⤋	\Downarrow	↗	\nersquigarrow	↘	\semapsto
↓	\downarrow	↙	\neswarrow	⇘	\senwarrows
↡	\downarrowtail	⇙	\Neswarrow	↘	\sersquigarrow
⇊	\downdownarrows	⇙	\neswarrows	⇘	\sesearrows
⇜	\downlsquigarrow	↖	\nwarrow	↯	\squigarrowdownup
↧	\downmapsto	⇖	\Nwarrow	↭	\squigarrowleftright
⇝	\downrsquigarrow	↖	\nwarrowtail	↭	\squigarrownesw
⇵	\downuparrows	↰	\nwlsquigarrow	⇳	\squigarrownwse
⥥	\lcirclearrowdown	↖	\nwmapsto	↭	\squigarrowrightleft
⥤	\lcirclearrowleft	⇖	\nwnwarrows	↯	\squigarrowsenw
⥦	\lcirclearrowright	↰	\nwrsquigarrow	↭	\squigarrowswne
⥧	\lcirclearrowup	↖	\nwsearrow	⇳	\squigarrowupdown
⤶	\lcurvearrowdown	⇖	\Nwsearrow	↙	\swarrow
⥿	\lcurvearrowleft	⇖	\nwsearrows	⇙	\Swarrow
⤻	\lcurvearrowne	⟲	\partialvardlcircleleftint*	↙	\swarrowtail
⤺	\lcurvearrownw	⟳	\partialvardlcirclerightint*	↙	\swlsquigarrow
⤳	\lcurvearrowright	⟲	\partialvardrcircleleftint*	↙	\swmapsto
⤷	\lcurvearrowse	⟳	\partialvardrcirclerightint*	↙	\swnearrows

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⤾	\lcurvearrowsw	⨐	\partialvartlcircleleftint*	⬐	\swrsquigarrow
⤿	\lcurvearrowup	⨑	\partialvartlcirclerightint*	⬋	\swswarrows
⇐	\Leftarrow	⨏	\partialvartrcircleleftint*	↡	\twoheaddownarrow
←	\leftarrow	⨒	\partialvartrcirclerightint*	↞	\twoheadleftarrow
↢	\leftarrowtail	⟲	\rcirclearrowdown	↗	\twoheadnearrow
⇇	\leftleftarrows	⟲	\rcirclearrowleft	↖	\twoheadnwarrow
⬿	\leftlsquigarrow	⟲	\rcirclearrowright	↠	\twoheadrightarrow
↤	\leftmapsto	⟲	\rcirclearrowup	↘	\twoheadsearrow
↔	\leftrightarrow	⤶	\rcurvearrowdown	↙	\twoheadswarrow
⇔	\Leftrightarrow	↶	\rcurvearrowleft	↟	\twoheaduparrow
⇆	\leftrightarrows	↱	\rcurvearrowne	↑	\uparrow
⬾	\leftrsquigarrow	↰	\rcurvearrownw	⇑	\Uparrow
⇃	\lhookdownarrow	↷	\rcurvearrowright	↥	\uparrowtail
↼	\lhookleftarrow	↳	\rcurvearrowse	↕	\updownarrow
↗	\lhooknearrow	↲	\rcurvearrowsw	⇕	\Updownarrow
↖	\lhooknwarrow	↴	\rcurvearrowup	⇅	\updownarrows
↪	\lhookrightarrow	⇂	\rhookdownarrow	⬽	\uplsquigarrow
↘	\lhooksearrow	↩	\rhookleftarrow	↥	\upmapsto
↙	\lhookswarrow	↗	\rhooknearrow	⬼	\uprsquigarrow
↾	\lhookuparrow	↖	\rhooknwarrow	⇈	\upuparrows
↯	\lightning	↪	\rhookrightarrow		
⇚	\Lleftarrow	↘	\rhooksearrow		

MnSymbol additionally defines synonyms for some of the preceding symbols:

↺	\circlearrowleft	(same as \rcirclearrowup)
↻	\circlearrowright	(same as \lcirclearrowup)
↶	\curvearrowleft	(same as \rcurvearrowleft)
↷	\curvearrowright	(same as \lcurvearrowright)
⇠	\dashleftarrow	(same as \dashedleftarrow)
⇢	\dashrightarrow	(same as \dashedrightarrow)
↩	\hookleftarrow	(same as \rhookleftarrow)
↪	\hookrightarrow	(same as \lhookrightarrow)
⇝	\leadsto	(same as \rightlsquigarrow)
↭	\leftrightsquigarrow	(same as \squigarrowleftright)
↦	\mapsto	(same as \rightmapsto)
⇝	\rightsquigarrow	(same as \rightlsquigarrow)

* The \partialvar...int macros are intended to be used internally by MnSymbol to produce various types of integrals.

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TABLE 107: MnSymbol Negated Arrows

	\ncurvearrowdownup		\nlhooknwarrow		\nrightleftarrows
	\ncurvearrowleftright		\nlhookrightarrow		\nrightlsquigarrow
	\ncurvearrownesw		\nlhooksearrow		\nrightmapsto
	\ncurvearrownwse		\nlhookswarrow		\nrightrightarrows
	\ncurvearrowrightleft		\nlhookuparrow		\nrightrsquigarrow
	\ncurvearrowsenw		\nLleftarrow		\nRrightarrow
	\ncurvearrowswne		\nnearrow		\nSearrow
	\ncurvearrowupdown		\nNearrow		\nsearrow
	\ndasheddownarrow		\nnearrowtail		\nsearrowtail
	\ndashedleftarrow		\nnelsquigarrow		\nselsquigarrow
	\ndashednearrow		\nnemapsto		\nsemapsto
	\ndashednwarrow		\nnenearrows		\nsenwarrows
	\ndashedrightarrow		\nnersquigarrow		\nsersquigarrow
	\ndashedsearrow		\nNeswarrow		\nsesearrows
	\ndashedswarrow		\nneswarrow		\nsquigarrowdownup
	\ndasheduparrow		\nneswarrows		\nsquigarrowleftright
	\ndownarrow		\nNwarrow		\nsquigarrownesw
	\nDownarrow		\nnwarrow		\nsquigarrownwse
	\ndownarrowtail		\nnwarrowtail		\nsquigarrowrightleft
	\ndowndownarrows		\nnwlsquigarrow		\nsquigarrowsenw
	\ndownlsquigarrow		\nnwmapsto		\nsquigarrowswne
	\ndownmapsto		\nnwnwarrows		\nsquigarrowupdown
	\ndownrsquigarrow		\nnwrsquigarrow		\nswarrow
	\ndownuparrows		\nnwsearrow		\nSwarrow
	\nlcirclearrowdown		\nNwsearrow		\nswarrowtail
	\nlcirclearrowleft		\nnwsearrows		\nswlsquigarrow
	\nlcirclearrowright		\nrcirclearrowdown		\nswmapsto
	\nlcirclearrowup		\nrcirclearrowleft		\nswnearrows
	\nlcurvearrowdown		\nrcirclearrowright		\nswrsquigarrow
	\nlcurvearrowleft		\nrcirclearrowup		\nswswarrows
	\nlcurvearrowne		\nrcurvearrowdown		\ntwoheaddownarrow
	\nlcurvearrownw		\nrcurvearrowleft		\ntwoheadleftarrow
	\nlcurvearrowright		\nrcurvearrowne		\ntwoheadnearrow
	\nlcurvearrowse		\nrcurvearrownw		\ntwoheadnwarrow
	\nlcurvearrowsw		\nrcurvearrowright		\ntwoheadrightarrow
	\nlcurvearrowup		\nrcurvearrowse		\ntwoheadsearrow
	\nLeftarrow		\nrcurvearrowsw		\ntwoheadswarrow
	\nleftarrow		\nrcurvearrowup		\ntwoheaduparrow
	\nleftarrowtail		\nrhookdownarrow		\nuparrow
	\nleftleftarrows		\nrhookleftarrow		\nUparrow
	\nleftlsquigarrow		\nrhooknearrow		\nuparrowtail
	\nleftmapsto		\nrhooknwarrow		\nupdownarrow
	\nleftrightarrow		\nrhookrightarrow		\nUpdownarrow
	\nLeftrightarrow		\nrhooksearrow		\nupdownarrows
	\nleftrightarrows		\nrhookswarrow		\nuplsquigarrow
	\nleftrsquigarrow		\nrhookuparrow		\nupmapsto

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↯	\nlhookdownarrow	↛	\nrightarrow	⇝	\nuprsquigarrow
↚	\nlhookleftarrow	⇏	\nRightarrow	⇈	\nupuparrows
↗	\nlhooknearrow	↣	\nrightarrowtail		

MnSymbol additionally defines synonyms for some of the preceding symbols:

↰	\ncirclearrowleft	(same as \nrcirclearrowup)
↱	\ncirclearrowright	(same as \nlcirclearrowup)
↜	\ncurvearrowleft	(same as \nrcurvearrowleft)
↝	\ncurvearrowright	(same as \nlcurvearrowright)
⇢	\ndasharrow	(same as \ndashedrightarrow)
⇠	\ndashleftarrow	(same as \ndashedleftarrow)
⇢	\ndashrightarrow	(same as \ndashedrightarrow)
↚	\ngets	(same as \nleftarrow)
↚	\nhookleftarrow	(same as \nrhookleftarrow)
↛	\nhookrightarrow	(same as \nlhookrightarrow)
↛	\nleadsto	(same as \nrightlsquigarrow)
↮	\nleftrightsquigarrow	(same as \nsquigarrowleftright)
↦	\nmapsto	(same as \nrightmapsto)
↛	\nrightsquigarrow	(same as \nrightlsquigarrow)
↛	\nto	(same as \nrightarrow)

TABLE 108: MnSymbol Harpoons

↽	\downharpoonccw*	⇗	\neswharpoons	↘	\seharpooncw
⇂	\downharpooncw*	↗	\neswharpoonsenw	⇘	\senwharpoons
⥯	\downupharpoons	↖	\nwharpoonccw	↙	\swharpoonccw
↼	\leftharpoonccw*	↖	\nwharpooncw	↙	\swharpooncw
↼	\leftharpooncw*	↘	\nwseharpoonnesw	⇙	\swneharpoons
⇋	\leftrightharpoondownup	⇖	\nwseharpoons	↿	\updownharpoonleftright
⇋	\leftrightharpoons	↘	\nwseharpoonswne	↾	\updownharpoonrightleft
⥮	\leftrightharpoonupdown	⇀	\rightharpoonccw*	⥮	\updownharpoons
↗	\neharpoonccw	⇀	\rightharpooncw*	↿	\upharpoonccw*
↗	\neharpooncw	⇌	\rightleftharpoons	↾	\upharpooncw*
↗	\neswharpoonnwse	↘	\seharpoonccw		

* Where marked, the "ccw" suffix can be replaced with "up" and the "cw" suffix can be replaced with "down". (In addition, \upharpooncw can be written as \restriction.)

Table 109: MnSymbol Negated Harpoons

↽̸	\ndownharpooncccw*	⥋̸	\nneswharpoons	↘̸	\nseharpooncw
⇁̸	\ndownharpooncw*	⥊̸	\nneswharpoonsenw	⤡̸	\nsenwharpoons
⥏̸	\ndownupharpoons	↖̸	\nnwharpoonccw	↙̸	\nswharpoonccw
↼̸	\nleftharpooncccw*	↖̸	\nnwharpooncw	⇃̸	\nswharpooncw
↼̸	\nleftharpooncw*	⥍̸	\nnwseharpoonnesw	⤢̸	\nswneharpoons
⥎̸	\nleftrightharpoondownup	⤡̸	\nnwseharpoons	⥐̸	\nupdownharpoonleftright
⇎	\nleftrightharpoons	⤡̸	\nnwseharpoonswne	⥑̸	\nupdownharpoonrightleft
⥊̸	\nleftrightharpoonupdown	⇀̸	\nrightharpooncccw*	⥏̸	\nupdownharpoons
↛	\nneharpooncccw	⇀̸	\nrightharpooncw*	↿̸	\nupharpooncccw*
↛	\nneharpooncw	⇌̸	\nrightleftharpoons	↾̸	\nupharpooncw*
↛	\nneswharpoonnwse	↘̸	\nseharpooncccw		

* Where marked, the "ccw" suffix can be replaced with "up" and the "cw" suffix can be replaced with "down". (In addition, \nupharpooncw can be written as \nrestriction.)

Table 110: chemarrow Arrows

→	\chemarrow

Table 111: fge Arrows

⤳	\fgerightarrow	↥	\fgeuparrow

Table 112: MnSymbol Spoons

⥋	\downfilledspoon	⥏	\nnespoon	⥘	\nwfilledspoon
⥋	\downspoon	⥘	\nnwfilledspoon	⥘	\nwspoon
⥊	\leftfilledspoon	⥘	\nnwspoon	⥋	\rightfilledspoon
⥊	\leftspoon	⥋	\nrightfilledspoon	⥋	\rightspoon*
⥐	\ndownfilledspoon	⥋	\nrightspoon*	⥘	\sefilledspoon
⥐	\ndownspoon	⥘	\nsefilledspoon	⥘	\sespoon
⥏	\nefilledspoon	⥘	\nsespoon	⥋	\swfilledspoon
⥏	\nespoon	⥋	\nswfilledspoon	⥋	\swspoon
⥊	\nleftfilledspoon	⥋	\nswspoon	⥣	\upfilledspoon
⥊	\nleftspoon	⥣	\nupfilledspoon	⥣	\upspoon
⥏	\nnefilledspoon	⥣	\nupspoon		

* MnSymbol defines \multimap as a synonym for \rightspoon and \nmultimap as a synonym for \nrightspoon.

Table 113: MnSymbol Pitchforks

⫛	\downpitchfork	⫘	\nnwpitchfork	⫢	\rightpitchfork
⫞	\leftpitchfork	⫣	\nrightpitchfork	⫬	\sepitchfork
⫟	\ndownpitchfork	⫭	\nsepitchfork	⫯	\swpitchfork
⫰	\nepitchfork	⫮	\nswpitchfork	⫝	\uppitchfork
⫠	\nleftpitchfork	⫝̸	\nuppitchfork		
⫱	\nnepitchfork	⫙	\nwpitchfork		

* MnSymbol defines \pitchfork as a synonym for \uppitchfork and \npitchfork as a synonym for \nuppitchfork.

Table 114: MnSymbol Smiles and Frowns

⩊	\doublefrown	⪱	\nsmileeq	⪰	\smileeq
⩋	\doublefrowneq	⪱̸	\nsmileeqfrown	⪳	\smileeqfrown
⩌	\doublesmile	⪳̸	\nsmilefrown	⪴	\smilefrown
⩍	\doublesmileeq	⪴̸	\nsmilefrowneq	⪵	\smilefrowneq
⩓	\eqfrown	⩊̸	\nsqdoublefrown	⩊	\sqdoublefrown
⩔	\eqsmile	⩋̸	\nsqdoublefrowneq	⩋	\sqdoublefrowneq
⌢	\frown	⩌̸	\nsqdoublesmile	⩌	\sqdoublesmile
⌓	\frowneq	⩍̸	\nsqdoublesmileeq	⩍	\sqdoublesmileeq
⩒	\frowneqsmile	≠̸	\nsqeqfrown	⩓	\sqeqfrown
⌣	\frownsmile	≠̸	\nsqeqsmile	⩔	\sqeqsmile
⌔	\frownsmileeq	⌢̸	\nsqfrown	⌢	\sqfrown
⩊̸	\ndoublefrown	⌓̸	\nsqfrowneq	⌓	\sqfrowneq
⩋̸	\ndoublefrowneq	⌓̸	\nsqfrowneqsmile	⩒	\sqfrowneqsmile
⩌̸	\ndoublesmile	⌣̸	\nsqfrownsmile	⌣	\sqfrownsmile
⩍̸	\ndoublesmileeq	⌣̸	\nsqsmile	⌣	\sqsmile
≠̸	\neqfrown	⪱̸	\nsqsmileeq	⪰	\sqsmileeq
≠̸	\neqsmile	⪱̸	\nsqsmileeqfrown	⪳	\sqsmileeqfrown
⌢̸	\nfrown	⪳̸	\nsqsmilefrown	⪴	\sqsmilefrown
⌓̸	\nfrowneq	⩊̸	\nsqtriplefrown	⩊	\sqtriplefrown
⌓̸	\nfrowneqsmile	⩌̸	\nsqtriplesmile	⩌	\sqtriplesmile
⌣̸	\nfrownsmile	⩊̸	\ntriplefrown	⩊	\triplefrown
⌣̸	\nfrownsmileeq	⩌̸	\ntriplesmile	⩌	\triplesmile
⌣̸	\nsmile	⌣	\smile		

* MnSymbol defines \smallsmile as a synonym for \smile, \smallfrown as a synonym for \frown, \asymp as a synonym for \smilefrown, and \nasymp as a synonym for \nsmilefrown.

Table 115: ulsy Contradiction Symbols

↯ \blitza ↯ \blitzb ↯ \blitzc ↯ \blitzd ↯ \blitze

Table 116: Extension Characters

– \relbar = \Relbar

Table 117: stmaryrd Extension Characters

⫽	\Arrownot	↦	\Mapsfromchar	↤	\Mapstochar
⫻	\arrownot	↦	\mapsfromchar		

Table 118: txfonts/pxfonts Extension Characters

⇿	\Mappedfromchar	⇾	\Mmappedfromchar	⇾	\Mmapstochar
⇿	\mappedfromchar	⇾	\mmappedfromchar	⇾	\mmapstochar

Table 119: mathabx Extension Characters

↦	\mapsfromchar	↦	\mapstochar
↦	\Mapsfromchar	↦	\Mapstochar

Table 120: Log-like Symbols

\arccos	\cos	\csc	\exp	\ker	\limsup	\min	\sinh
\arcsin	\cosh	\deg	\gcd	\lg	\ln	\Pr	\sup
\arctan	\cot	\det	\hom	\lim	\log	\sec	\tan
\arg	\coth	\dim	\inf	\liminf	\max	\sin	\tanh

Calling the above "symbols" may be a bit misleading.[2] Each log-like symbol merely produces the eponymous textual equivalent, but with proper surrounding spacing. See Section 7.4 for more information about log-like symbols. As \bmod and \pmod are arguably not symbols we refer the reader to the Short Math Guide for LaTeX [Dow00] for samples.

Table 121: $\mathcal{AMS}$ Log-like Symbols

inj lim	\injlim	$\varinjlim$	\varinjlim	$\varlimsup$	\varlimsup
proj lim	\projlim	$\varliminf$	\varliminf	$\varprojlim$	\varprojlim

Load the amsmath package to get these symbols. See Section 7.4 for some additional comments regarding log-like symbols. As \mod and \pod are arguably not symbols we refer the reader to the Short Math Guide for LaTeX [Dow00] for samples.

[2] Michael J. Downes prefers the more general term, "atomic math objects".

Table 122: Greek Letters

α	\alpha	θ	\theta	o	o	τ	\tau
β	\beta	ϑ	\vartheta	π	\pi	υ	\upsilon
γ	\gamma	ι	\iota	ϖ	\varpi	ϕ	\phi
δ	\delta	κ	\kappa	ρ	\rho	φ	\varphi
ϵ	\epsilon	λ	\lambda	ϱ	\varrho	χ	\chi
ε	\varepsilon	μ	\mu	σ	\sigma	ψ	\psi
ζ	\zeta	ν	\nu	ς	\varsigma	ω	\omega
η	\eta	ξ	\xi				
Γ	\Gamma	Λ	\Lambda	Σ	\Sigma	Ψ	\Psi
Δ	\Delta	Ξ	\Xi	Υ	\Upsilon	Ω	\Omega
Θ	\Theta	Π	\Pi	Φ	\Phi		

The remaining Greek majuscules can be produced with ordinary Latin letters. The symbol "M", for instance, is used for both an uppercase "m" and an uppercase "μ". See Section 7.5 for examples of how to produce bold Greek letters.

Table 123: $\mathcal{AMS}$ Greek Letters

$\digamma$	\digamma	$\varkappa$	\varkappa

Table 124: txfonts/pxfonts Upright Greek Letters

α	\alphaup	θ	\thetaup	π	\piup	ϕ	\phiup
β	\betaup	ϑ	\varthetaup	ϖ	\varpiup	φ	\varphiup
γ	\gammaup	ι	\iotaup	ρ	\rhoup	χ	\chiup
δ	\deltaup	κ	\kappaup	ϱ	\varrhoup	ψ	\psiup
ϵ	\epsilonup	λ	\lambdaup	σ	\sigmaup	ω	\omegaup
ε	\varepsilonup	μ	\muup	ς	\varsigmaup		
ζ	\zetaup	ν	\nuup	τ	\tauup		
η	\etaup	ξ	\xiup	υ	\upsilonup		

Table 125: upgreek Upright Greek Letters

$\upalpha$	\upalpha	$\uptheta$	\uptheta	$\uppi$	\uppi	$\upphi$	\upphi
$\upbeta$	\upbeta	$\upvartheta$	\upvartheta	$\upvarpi$	\upvarpi	$\upvarphi$	\upvarphi
$\upgamma$	\upgamma	$\upiota$	\upiota	$\uprho$	\uprho	$\upchi$	\upchi
$\updelta$	\updelta	$\upkappa$	\upkappa	$\upvarrho$	\upvarrho	$\uppsi$	\uppsi
$\upepsilon$	\upepsilon	$\uplambda$	\uplambda	$\upsigma$	\upsigma	$\upomega$	\upomega
$\upvarepsilon$	\upvarepsilon	$\upmu$	\upmu	$\upvarsigma$			
$\upzeta$	\upzeta	$\upnu$	\upnu	$\uptau$			
$\upeta$	\upeta	$\upxi$	\upxi	$\upupsilon$			
$\Upgamma$	\Upgamma	$\Uplambda$	\Uplambda	$\Upsigma$	\Upsigma	$\Uppsi$	\Uppsi
$\Updelta$	\Updelta	$\Upxi$	\Upxi	$\Upupsilon$	\Upupsilon	$\Upomega$	\Upomega
$\Uptheta$	\Uptheta	$\Uppi$	\Uppi	$\Upphi$	\Upphi		

upgreek utilizes upright Greek characters from either the PostScript Symbol font (depicted above) or Euler Roman. As a result, the glyphs may appear slightly different from the above. Contrast, for example, "ΓΔΘαβγ" (Symbol) with "ΓΔΘαβγ" (Euler).

Table 126: txfonts/pxfonts Variant Latin Letters

g	\varg	v	\varv	w	\varw	y	\vary

Pass the varg option to txfonts/pxfonts to replace g, v, w, and y with g, v, w, and y in every mathematical expression in your document.

Table 127: $\mathcal{A}\mathcal{M}\mathcal{S}$ Hebrew Letters

ב	\beth	ג	\gimel	ד	\daleth

\aleph (א) appears in Table 184 on page 67.

Table 128: MnSymbol Hebrew Letters

א	\aleph	ב	\beth	ג	\gimel	ד	\daleth

Table 129: Letter-like Symbols

$\bot$	\bot	$\forall$	\forall	$\imath$	\imath	$\ni$	\ni	$\top$	\top
ℓ	\ell	$\hbar$	\hbar	$\in$	\in	∂	\partial	$\wp$	\wp
$\exists$	\exists	$\Im$	\Im	$\jmath$	\jmath	$\Re$	\Re		

TABLE 130: $\mathcal{AMS}$ Letter-like Symbols

$\Bbbk$	\Bbbk	$\complement$	\complement	$\hbar$	\hbar
®	\circledR	$\Finv$	\Finv	$\hslash$	\hslash
Ⓢ	\circledS	$\Game$	\Game	$\nexists$	\nexists

TABLE 131: txfonts/pxfonts Letter-like Symbols

¢	\mathcent	£	\mathsterling*	∉	\notin	∌	\notni

* It's generally preferable to use the corresponding symbol from Table 3 on page 9 because the symbols in that table work properly in both text mode and math mode.

TABLE 132: mathabx Letter-like Symbols

$\barin$	\barin	$\in$	\in	$\nottop$	\nottop	$\varnotin$	\varnotin
$\complement$	\complement	$\nexists$	\nexists	$\ni$	\owns	$\varnotowner$	\varnotowner
$\exists$	\exists	$\notbot$	\notbot	$\ni$	\ownsbar		
$\Finv$	\Finv	$\notin$	\notin	∂	\partial		
$\Game$	\Game	$\notowner$	\notowner	$\partialslash$	\partialslash		

TABLE 133: MnSymbol Letter-like Symbols

$\bot$	\bot	$\in$	\in	$\nowns$*	\nowns*	$\top$	\top
$\exists$	\exists	$\nexists$	\nexists	$\ni$	\owns	$\wp$	\wp
$\forall$	\forall	$\notin$	\nin*	$\wp$	\powerset		

* MnSymbol provides synonyms \notin for \nin, \ni for \owns, and \intercal for \top.

TABLE 134: trfsigns Letter-like Symbols

e	\e	j	\im

TABLE 135: mathdesign Letter-like Symbols

$\in$	\in	$\ni$	\owns
$\notin$	\notin	$\in$	\smallin
$\notin$	\notsmallin	$\ni$	\smallowns
$\notin$	\notsmallowns		

The mathdesign package additionally provides versions of each of the letter-like symbols shown in Table 130.

TABLE 136: fge Letter-like Symbols

𝔄	\fgeA	𝔤	\fgeeszett	𝔅	\fgeleftB	𝔘	\fgeU
𝔠	\fgec	𝓕	\fgeF	ℭ	\fgeleftC		
𝔭	\fged	𝔣	\fgef	𝔅	\fgerightB		
𝔢	\fgee	𝔫	\fgelb*	𝔣	\fges		

* The fge package defines \fgeeta, \fgeN, and \fgeoverU as synonyms for \fgelb.

TABLE 137: $\mathcal{AMS}$ Delimiters

⌜	\ulcorner	⌝	\urcorner
⌞	\llcorner	⌟	\lrcorner

TABLE 138: stmaryrd Delimiters

⦉	\Lbag	⦊	\Rbag	⦇	\lbag	⦈	\rbag
⌈⌈	\llceil	⌉⌉	\rrceil	⌊⌊	\llfloor	⌋⌋	\rrfloor
⦅	\llparenthesis	⦆	\rrparenthesis				

TABLE 139: mathabx Delimiters

⌜	\lcorners	⌝	\rcorners
⌜	\ulcorner	⌝	\urcorner
⌞	\llcorner	⌟	\lrcorner

TABLE 140: nath Delimiters

∟	\niv	⌟	\vin

TABLE 141: Variable-sized Delimiters

$\downarrow$	$\left\downarrow\right.$	`\downarrow`	$\Downarrow$	$\left\Downarrow\right.$	`\Downarrow`	[	$\left[\right.$	`[`	]	$\left.\right]$	`]`
$\langle$	$\left\langle\right.$	`\langle`	$\rangle$	$\left.\right\rangle$	`\rangle`	$\vert$	$\left\vert\right.$	`|`	$\Vert$	$\left.\right\Vert$	`\\|`
$\lceil$	$\left\lceil\right.$	`\lceil`	$\rceil$	$\left.\right\rceil$	`\rceil`	$\uparrow$	$\left\uparrow\right.$	`\uparrow`	$\Uparrow$	$\left.\right\Uparrow$	`\Uparrow`
$\lfloor$	$\left\lfloor\right.$	`\lfloor`	$\rfloor$	$\left.\right\rfloor$	`\rfloor`	$\updownarrow$	$\left\updownarrow\right.$	`\updownarrow`	$\Updownarrow$	$\left.\right\Updownarrow$	`\Updownarrow`
(	$\left($	`(`	)	$\left.\right)$	`)`	{	$\left\{\right.$	`\{`	}	$\left.\right\}$	`\}`
/	$\left/\right.$	`/`	\	$\left.\right\backslash$	`\backslash`						

When used with `\left` and `\right`, these symbols expand to the height of the enclosed math expression. Note that `\vert` is a synonym for `|`, and `\Vert` is a synonym for `\|`.

ε-TEX provides a `\middle` analogue to `\left` and `\right`. `\middle` can be used, for example, to make an internal "|" expand to the height of the surrounding `\left` and `\right` symbols. (This capability is commonly needed when typesetting adjacent bras and kets in Dirac notation: "$\langle\phi|\psi\rangle$"). A similar effect can be achieved in conventional LATEX using the braket package.

TABLE 142: Large, Variable-sized Delimiters

$\int$	$\left\int\right.$	`\lmoustache`	$\rangle$	$\left.\right\rangle$	`\rmoustache`	(	$\left($	`\lgroup`	)	$\left.\right)$	`\rgroup`
$\vert$	$\left\vert\right.$	`\arrowvert`	$\Vert$	$\left.\right\Vert$	`\Arrowvert`	$\mid$	$\left\mid\right.$	`\bracevert`			

These symbols *must* be used with `\left` and `\right`. The mathabx package, however, redefines `\lgroup` and `\rgroup` so that those symbols can work without `\left` and `\right`.

TABLE 143: $\mathcal{AMS}$ Variable-sized Delimiters

$\vert$	$\left\vert\right.$	`\lvert`	$\vert$	$\left.\right\vert$	`\rvert`
$\Vert$	$\left\Vert\right.$	`\lVert`	$\Vert$	$\left.\right\Vert$	`\rVert`

According to the amsmath documentation [AMS99], the preceding symbols are intended to be used as delimiters (e.g., as in "$|-z|$") while the `\vert` and `\Vert` symbols (Table 141) are intended to be used as operators (e.g., as in "$p|q$").

TABLE 144: stmaryrd Variable-sized Delimiters

⟦	⟦	\llbracket	⟧	⟧	\rrbracket

TABLE 145: mathabx Variable-sized Delimiters

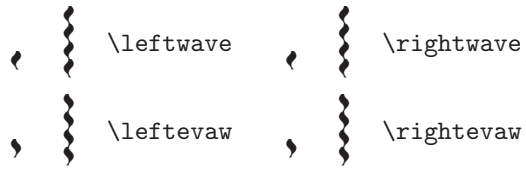
⟦	⟦	\ldbrack	⟧	⟧	\rdbrack
❨	❨	\lfilet	❩	❩	\rfilet
|	|	\thickvert	‖	‖	\vvvert

TABLE 146: MnSymbol Variable-sized Delimiters

⌈	\lceil	⌉	\rceil	⌜	\ulcorner	⌝	\urcorner
⌊	\lfloor	⌋	\rfloor	⌞	\llcorner	⌟	\lrcorner
⦘	\lwavy	⦘	\rwavy	⟨	\langle	⟩	\rangle
⧚	\lWavy	⧚	\rWavy	⧼	\langlebar	⧽	\ranglebar
(	(	)	)	⟮	\lgroup	⟯	\rgroup
⟦	\lsem	⟧	\rsem	⟪	\llangle	⟫	\rrangle
∫	\lmoustache	⎭	\rmoustache	{	\lbrace	}	\rbrace
/	/	\	\backslash	<	<	>	>
[	[	]	]	⌜	\ullcorner	⌝	\ulrcorner
∣	∣	‖	|	∣	\bracevert		
↑	\arrowvert	⇑	\Arrowvert				

\vert is a synonym for |. \Vert is a synonym for \|. \mid and \mvert produce the same symbol as \vert but designated as math relations instead of ordinals. \divides produces the same symbol as \vert but designated as a binary operator instead of an ordinal. \parallel and \mVert produce the same symbol as \Vert but designated as math relations instead of ordinals.

TABLE 147: mathdesign Variable-sized Delimiters



The definitions of these symbols include a preceding `\left` or `\right`. It is therefore an error to specify `\left` or `\right` explicitly. The internal, "primitive" versions of these symbols are called `\lwave`, `\rwave`, `\levaw`, and `\revaw`.

TABLE 148: nath Variable-sized Delimiters (Double)

⟪	⟪	`\lAngle`	⟫	⟫	`\rAngle`
⟦	⟦	`\lBrack`	⟧	⟧	`\rBrack`
⌈	⌈	`\lCeil`	⌉	⌉	`\rCeil`
⌊	⌊	`\lFloor`	⌋	⌋	`\rFloor`
‖	‖	`\lVert`*	‖	‖	`\rVert`*

* nath redefines all of the above to include implicit `\left` and `\right` commands. Hence, separate `\lVert` and `\rVert` commands are needed to disambiguate whether "`|`" is a left or right delimiter.

All of the symbols in Table 148 can also be expressed using the `\double` macro. See the nath documentation for examples and additional information.

TABLE 149: nath Variable-sized Delimiters (Triple)

⟪	⟪	`\triple<`	⟫	⟫	`\triple>`
⟦	⟦	`\triple[`	⟧	⟧	`\triple]`
⦀	⦀	`\ltriple|`*	⦀	⦀	`\rtriple|`*

* Similar to `\lVert` and `\rVert` in Table 148, `\ltriple` and `\rtriple` must be used instead of `\triple` to disambiguate whether "`|`" is a left or right delimiter.

Note that `\triple`—and the corresponding `\double`—is actually a macro that takes a delimiter as an argument.

Table 150: textcomp Text-mode Delimiters

⟨	`\textlangle`	⟩	`\textrangle`
⟦	`\textlbrackdbl`	⟧	`\textrbrackdbl`
⦃	`\textlquill`	⦄	`\textrquill`

Table 151: metre Text-mode Delimiters

⦄	`\alad`	⦃	`\Alad`	†	`\crux`	‡	`\Crux`
⦃	`\alas`	⦄	`\Alas`	⟧	`\quadrad`	⟦	`\Quadrad`
⟩	`\angud`	⟩	`\Angud`	⟦	`\quadras`	⟧	`\Quadras`
⟨	`\angus`	⟨	`\Angus`				

Table 152: Math-mode Accents

$\acute{a}$	`\acute{a}`	$\check{a}$	`\check{a}`	$\grave{a}$	`\grave{a}`	$\tilde{a}$	`\tilde{a}`
$\bar{a}$	`\bar{a}`	$\ddot{a}$	`\ddot{a}`	$\hat{a}$	`\hat{a}`	$\vec{a}$	`\vec{a}`
$\breve{a}$	`\breve{a}`	$\dot{a}$	`\dot{a}`	$\mathring{a}$	`\mathring{a}`		

Also note the existence of `\imath` and `\jmath`, which produce dotless versions of "$\imath$" and "$\jmath$". (See Table 184 on page 67.) These are useful when the accent is supposed to replace the dot. For example, "`\hat{\imath}`" produces a correct "$\hat{\imath}$", while "`\hat{i}`" would yield the rather odd-looking "$\hat{i}$".

Table 153: $\mathcal{AMS}$ Math-mode Accents

$\ddot{\ddot{a}}$	`\dddot{a}`	$\dddot{\ddot{a}}$	`\ddddot{a}`

These accents are also provided by the mathabx and accents packages and are redefined by the mathdots package if the amsmath and amssymb packages have previously been loaded. All of the variations except for the original $\mathcal{AMS}$ ones tighten the space between the dots (from $\ddot{\ddot{a}}$ to $\ddot{\ddot{a}}$). The mathabx and mathdots versions also function properly within subscripts and superscripts ($x^{\ddot{\ddot{a}}}$ instead of $x^{\ddot{\ddot{a}}}$) .

Table 154: MnSymbol Math-mode Accents

$\vec{a}$	`\vec{a}`

Table 155: fge Math-mode Accents

Ḁ̊ḁ̊	`\spirituslenis{A}\spirituslenis{a}`*

* When fge is passed the crescent option, `\spirituslenis` instead uses a crescent accent as in "ḁ̊".

TABLE 156: yhmath Math-mode Accents

$\mathring{a}$	`\ring{a}`

This symbol is largely obsolete, as standard LaTeX 2_ε has supported `\mathring` since June, 1998 [LaT98].

TABLE 157: Extensible Accents

$\widetilde{abc}$	`\widetilde{abc}`*	$\widehat{abc}$	`\widehat{abc}`*
$\overleftarrow{abc}$	`\overleftarrow{abc}`†	$\overrightarrow{abc}$	`\overrightarrow{abc}`†
$\overline{abc}$	`\overline{abc}`	$\underline{abc}$	`\underline{abc}`
$\overbrace{abc}$	`\overbrace{abc}`	$\underbrace{abc}$	`\underbrace{abc}`
$\sqrt{abc}$	`\sqrt{abc}`‡		

As demonstrated in a 1997 TUGboat article about typesetting long-division problems [Gib97], an extensible long-division sign ("$)\overline{abc}$") can be faked by putting a "`\big)`" in a `tabular` environment with an `\hline` or `\cline` in the preceding row. The article also presents a piece of code (uploaded to CTAN as `longdiv.tex`) that automatically solves and typesets—by putting an `\overline` atop "`\big)`" and the desired text—long-division problems. See also the polynom package, which automatically solves and typesets polynomial-division problems in a similar manner.

* These symbols are made more extensible by the MnSymbol package and even more extensible by the yhmath package.

† If you're looking for an extensible *diagonal* line or arrow to be used for canceling or reducing mathematical subexpressions (e.g., "$\cancel{x+=x}$" or "$\cancel{3+2}^{5}$") then consider using the cancel package.

‡ With an optional argument, `\sqrt` typesets nth roots. For example, "`\sqrt[3]{abc}`" produces "$\sqrt[3]{abc}$" and "`\sqrt[n]{abc}`" produces "$\sqrt[n]{abc}$".

TABLE 158: overrightarrow Extensible Accents

$\overRightarrow{abc}$	`\Overrightarrow{abc}`

TABLE 159: yhmath Extensible Accents

$\wideparen{abc}$	`\wideparen{abc}`	$\widetriangle{abc}$	`\widetriangle{abc}`
$\widering{abc}$	`\widering{abc}`		

TABLE 160: $\mathcal{AMS}$ Extensible Accents

$\overleftrightarrow{abc}$	`\overleftrightarrow{abc}`	$\underleftrightarrow{abc}$	`\underleftrightarrow{abc}`
$\underleftarrow{abc}$	`\underleftarrow{abc}`	$\underrightarrow{abc}$	`\underrightarrow{abc}`

TABLE 161: MnSymbol Extensible Accents

$\overbrace{abc}$	`\overbrace{abc}`	$\underbrace{abc}$	`\underbrace{abc}`
$\overgroup{abc}$	`\overgroup{abc}`	$\undergroup{abc}$	`\undergroup{abc}`
$\overline{abc}$	`\overlinesegment{abc}`	$\underline{abc}$	`\underlinesegment{abc}`
$\overleftarrow{abc}$	`\overleftharpoon{abc}`	$\overrightarrow{abc}$	`\overrightharpoon{abc}`
$\widehat{abc}$	`\widehat{abc}`	$\widetilde{abc}$	`\widetilde{abc}`
$\wideparen{abc}$	`\wideparen{abc}`		

TABLE 162: mathtools Extensible Accents

$\overbrace{abc}$	`\overbrace{abc}`	$\underbrace{abc}$	`\underbrace{abc}`
$\overbracket{abc}$	`\overbracket{abc}`*	$\underbracket{abc}$	`\underbracket{abc}`*

* `\overbracket` and `\underbracket` accept optional arguments that specify the bracket height and thickness. See the mathtools documentation for more information.

TABLE 163: mathabx Extensible Accents

$\overbrace{abc}$	`\overbrace{abc}`	$\widebar{abc}$	`\widebar{abc}`
$\overgroup{abc}$	`\overgroup{abc}`	$\widecheck{abc}$	`\widecheck{abc}`
$\underbrace{abc}$	`\underbrace{abc}`	$\wideparen{abc}$	`\wideparen{abc}`
$\undergroup{abc}$	`\undergroup{abc}`	$\widering{abc}$	`\widering{abc}`
$\widearrow{abc}$	`\widearrow{abc}`		

The braces shown for `\overbrace` and `\underbrace` appear in their minimum size. They can expand arbitrarily wide, however.

TABLE 164: esvect Extensible Accents

$\overrightarrow{abc}$	`\vv{abc}` with package option `a`
$\overrightarrow{abc}$	`\vv{abc}` with package option `b`
$\overrightarrow{abc}$	`\vv{abc}` with package option `c`
$\overrightarrow{abc}$	`\vv{abc}` with package option `d`
$\overrightarrow{abc}$	`\vv{abc}` with package option `e`
$\overrightarrow{abc}$	`\vv{abc}` with package option `f`
$\overrightarrow{abc}$	`\vv{abc}` with package option `g`
$\overrightarrow{abc}$	`\vv{abc}` with package option `h`

esvect also defines a `\vv*` macro which is used to typeset arrows over vector variables with subscripts. See the esvect documentation for more information.

TABLE 165: undertilde Extensible Accents

$\underset{\sim}{abc}$	`\utilde{abc}`

Because `\utilde` is based on `\widetilde` it is also made more extensible by the yhmath package.

TABLE 166: $\mathcal{AMS}$ Extensible Arrows

$\xleftarrow{abc}$	`\xleftarrow{abc}`	$\xrightarrow{abc}$	`\xrightarrow{abc}`

TABLE 167: mathtools Extensible Arrows

$\xhookleftarrow{abc}$	`\xhookleftarrow{abc}`	$\xleftrightharpoons{abc}$	`\xleftrightharpoons{abc}`
$\xhookrightarrow{abc}$	`\xhookrightarrow{abc}`	$\xmapsto{abc}$	`\xmapsto{abc}`
$\xLeftarrow{abc}$	`\xLeftarrow{abc}`	$\xRightarrow{abc}$	`\xRightarrow{abc}`
$\xleftharpoondown{abc}$	`\xleftharpoondown{abc}`	$\xrightharpoondown{abc}$	`\xrightharpoondown{abc}`
$\xleftharpoonup{abc}$	`\xleftharpoonup{abc}`	$\xrightharpoonup{abc}$	`\xrightharpoonup{abc}`
$\xleftrightarrow{abc}$	`\xleftrightarrow{abc}`	$\xrightleftharpoons{abc}$	`\xrightleftharpoons{abc}`
$\xLeftrightarrow{abc}$	`\xLeftrightarrow{abc}`		

TABLE 168: chemarr Extensible Arrows

$\xrightleftharpoons{abc}$	`\xrightleftharpoons{abc}`

Table 169: chemarrow Extensible Arrows

$\xleftarrow[\text{def}]{\text{abc}}$	`\autoleftarrow{abc}{def}`	$\xrightarrow[\text{def}]{\text{abc}}$	`\autorightarrow{abc}{def}`
$\xleftharpoondown\!\!\xrightharpoonup[\text{def}]{\text{abc}}$	`\autoleftrightharpoons{abc}{def}`	$\xrightleftharpoons[\text{def}]{\text{abc}}$	`\autorightleftharpoons{abc}{def}`

In addition to the symbols shown above, chemarrow also provides `\larrowfill`, `\rarrowfill`, `\leftrightharpoonsfill`, and `\rightleftharpoonsfill` macros. Each of these takes a length argument and produces an arrow of the specified length.

Table 170: trfsigns Extensible Arrows

$\vdash\!\!\!-_{a}$	`\dft{a}`	$-\!\!\!-\!\dashv_{a}$	`\DFT{a}`

Table 171: extarrows Extensible Arrows

$\xLeftrightarrow{abc}$	`\xLeftrightarrow{abc}`	$\xLongleftrightarrow{abc}$	`\xLongleftrightarrow{abc}`
$\xleftrightarrow{abc}$	`\xleftrightarrow{abc}`	$\xlongleftrightarrow{abc}$	`\xlongleftrightarrow{abc}`
$\xlongequal{abc}$	`\xlongequal{abc}`	$\xRightarrow{abc}$	`\xLongrightarrow{abc}`
$\xLeftarrow{abc}$	`\xLongleftarrow{abc}`	$\xrightarrow{abc}$	`\xlongrightarrow{abc}`
$\xleftarrow{abc}$	`\xlongleftarrow{abc}`		

Table 172: extpfeil Extensible Arrows

$\xlongequal{abc}$	`\xlongequal{abc}`	$\xmapsto{abc}$	`\xmapsto{abc}`
$\xtwoheadleftarrow{abc}$	`\xtwoheadleftarrow{abc}`	$\xtwoheadrightarrow{abc}$	`\xtwoheadrightarrow{abc}`

The extpfeil package also provides a `\newextarrow` command to help you define your own extensible arrow symbols. See the extpfeil documentation for more information.

Table 173: holtpolt Non-commutative Division Symbols

$\left\lfloor\frac{abc}{def}\right\rfloor$	`\holter{abc}{def}`	$\left\lceil\frac{abc}{def}\right\rceil$	`\polter{abc}{def}`

Table 174: Dots

$\cdotp$	`\cdotp`	$:$	`\colon`*	$.$	`\ldotp`	$\vdots$	`\vdots`†
$\cdots$	`\cdots`	$\ddots$	`\ddots`†	$\ldots$	`\ldots`		

* While ":" is valid in math mode, `\colon` uses different surrounding spacing. See Section 7.4 and the Short Math Guide for LaTeX [Dow00] for more information on math-mode spacing.

† The mathdots package redefines `\ddots` and `\vdots` to make them scale properly with font size. (They normally scale horizontally but not vertically.) `\fixedddots` and `\fixedvdots` provide the original, fixed-height functionality of LaTeX 2$_\varepsilon$'s `\ddots` and `\vdots` macros.

Table 175: $\mathcal{AMS}$ Dots

$\because$	`\because`*	$\cdots$	`\dotsi`	$\therefore$	`\therefore`*
$\cdots$	`\dotsb`	$\cdots$	`\dotsm`		
$\ldots$	`\dotsc`	$\ldots$	`\dotso`		

* `\because` and `\therefore` are defined as binary relations and therefore also appear in Table 63 on page 31.

The $\mathcal{AMS}$ `\dots`_ symbols are named according to their intended usage: `\dotsb` between pairs of binary operators/relations, `\dotsc` between pairs of commas, `\dotsi` between pairs of integrals, `\dotsm` between pairs of multiplication signs, and `\dotso` between other symbol pairs.

Table 176: wasysym Dots

$\therefore$	`\wasytherefore`

Table 177: MnSymbol Dots

⋅	\cdot	⋰	\iddots	⋱	\ddots
⋯	\hdots	⋮	\vdots	⋮	\vdots
⋰	\udots	∴	\therefore	∵	\because
⋱	\ddots	⋰	\udots	⋮	\vdots
⋱	\ddots	⋰	\udots	⋮	\vdots

MnSymbol defines \therefore as \uptherefore and \because as \downtherefore. Furthermore, \cdotp and \colon produce the same glyphs as \cdot and \vdotdot respectively but serve as TEX math punctuation (class 6 symbols) instead of TEX binary operators (class 2).

All of the above except \hdots and \vdots are defined as binary operators and therefore also appear in Table 46 on page 24. Also, unlike most of the other dot symbols in this document, MnSymbol's dots are defined as single characters instead of as composites of multiple single-dot characters.

Table 178: mathdots Dots

⋰	\iddots

Table 179: yhmath Dots

⋰	\adots

Table 180: mathcomp Math Symbols

℃	\tccentigrade	Ω	\tcohm	‰	\tcperthousand
µ	\tcmu	‱	\tcpertenthousand		

Table 181: mathabx Mayan Digits

𝋠	\maya{0}	𝋡	\maya{2}	𝋢	\maya{4}
𝋡	\maya{1}	𝋢	\maya{3}	𝋣	\maya{5}

Table 182: marvosym Digits

0	\MVZero	2	\MVTwo	4	\MVFour	6	\MVSix	8	\MVEight
1	\MVOne	3	\MVThree	5	\MVFive	7	\MVSeven	9	\MVNine

TABLE 183: fge Digits

𝟘	\fgestruckzero	𝟙	\fgestruckone

TABLE 184: Miscellaneous LaTeX 2ε Math Symbols

ℵ	\aleph	◇	\Diamond*	∞	\infty	′	\prime
∠	\angle	♢	\diamondsuit	℧	\mho*	♯	\sharp
\	\backslash	∅	\emptyset‡	∇	\nabla	♠	\spadesuit
□	\Box*,†	♭	\flat	♮	\natural	√	\surd
♣	\clubsuit	♡	\heartsuit	¬	\neg	△	\triangle

* Not predefined in LaTeX 2ε. Use one of the packages latexsym, amsfonts, amssymb, txfonts, pxfonts, or wasysym. Note, however, that amsfonts and amssymb define \Diamond to produce the same glyph as \lozenge ("◊"); the other packages produce a squarer \Diamond as depicted above.

† To use \Box—or any other symbol—as an end-of-proof (Q.E.D.) marker, consider using the ntheorem package, which properly juxtaposes a symbol with the end of the proof text.

‡ Many people prefer the look of $\mathcal{AMS}$'s \varnothing ("∅", Table 185) to that of LaTeX's \emptyset.

TABLE 185: Miscellaneous $\mathcal{AMS}$ Math Symbols

∠	\angle	▼	\blacktriangledown	℧	\mho
∖	\backprime	╲	\diagdown	◁	\sphericalangle
★	\bigstar	╱	\diagup	□	\square
⧫	\blacklozenge	ð	\eth	▽	\triangledown
■	\blacksquare	◊	\lozenge	∅	\varnothing
▲	\blacktriangle	∡	\measuredangle	△	\vartriangle

TABLE 186: Miscellaneous wasysym Math Symbols

□	\Box	◇	\Diamond	℧	\mho*	⦟	\varangle

* wasysym also defines an \agemO symbol, which is the same glyph as \mho but is intended for use in text mode.

TABLE 187: Miscellaneous txfonts/pxfonts Math Symbols

◆	\Diamondblack	ƛ	\lambdaslash	♥	\varheartsuit
⟐	\Diamonddot	♧	\varclubsuit	♤	\varspadesuit
ƛ	\lambdabar	♦	\vardiamondsuit		

Table 188: Miscellaneous mathabx Math Symbols

∘	\degree	⁗	\fourth	∡	\measuredangle	″	\second
⧹	\diagdown	#	\hash	⋔	\pitchfork	⍼	\sphericalangle
⧸	\diagup	∞	\infty	∝	\propto	‴	\third
∅	\diameter	⋉	\leftthreetimes	⋌	\rightthreetimes	#	\varhash

Table 189: Miscellaneous MnSymbol Math Symbols

∠	\angle	♢	\diamondsuit	✠	\maltese	♯	\sharp
⌐	\backneg	♭	\flat	∡	\measuredangle	∫	\smallint
‵	\backprime	♡	\heartsuit	∇	\nabla	♠	\spadesuit
✓	\checkmark	∞	\infty	♮	\natural	∢	\sphericalangle
♣	\clubsuit	⌙	\invbackneg	¬	\neg		
∅	\diameter	⌐	\invneg	′	\prime		

MnSymbol defines \emptyset and \varnothing as synonyms for \diameter; \lnot and \minushookdown as synonyms for \neg; \minushookup as a synonym for \invneg; \hookdownminus as a synonym for \backneg; and, \hookupminus as a synonym for \invbackneg.

Table 190: Miscellaneous Internal MnSymbol Math Symbols

⋯	\partialvardint	⋯	\partialvartint
⌣	\partialvardlanddownint	⌣	\partialvartlanddownint
⌢	\partialvardlandupint	⌢	\partialvartlandupint
∲	\partialvardlcircleleftint	∲	\partialvartlcircleleftint
∳	\partialvardlcirclerightint	∳	\partialvartlcirclerightint
⍝	\partialvardoiint	⍝	\partialvartoiint
○	\partialvardoint	○	\partialvartoint
∲	\partialvardrcircleleftint	∲	\partialvartrcircleleftint
∳	\partialvardrcirclerightint	∳	\partialvartrcirclerightint
⨍	\partialvardstrokedint	⨍	\partialvartstrokedint
∑	\partialvardsumint	Σ	\partialvartsumint

These symbols are intended to be used internally by MnSymbol to construct the integrals appearing in Table 59 on page 30 but can nevertheless be used in isolation.

TABLE 191: Miscellaneous textcomp Text-mode Math Symbols

°	\textdegree*	½	\textonehalf†	¾	\textthreequarters†
÷	\textdiv	¼	\textonequarter†	³	\textthreesuperior
/	\textfractionsolidus	¹	\textonesuperior	×	\texttimes
¬	\textlnot	±	\textpm	²	\texttwosuperior
−	\textminus	√	\textsurd		

* If you prefer a larger degree symbol you might consider defining one as "\ensuremath{^\circ}" ("°").

† nicefrac (part of the units package) can be used to construct vulgar fractions like "1/2", "1/4", "3/4", and even "c/o".

TABLE 192: Miscellaneous marvosym Math Symbols

∢	\Anglesign	·	\Squaredot	→	\Vectorarrowhigh
≙	\Corresponds	→	\Vectorarrow		

TABLE 193: Miscellaneous fge Math Symbols

\	\fgebackslash	∩	\fgecap	⩎	\fgecupacute	⟨	\fgelangle
⩏	\fgebaracute	⩋	\fgecapbar	⩌	\fgecupbar	⌋	\fgeupbracket
⩓	\fgebarcap	∪	\fgecup	∾	\fgeinfty		

TABLE 194: Miscellaneous mathdesign Math Symbols

∟	\rightangle

TABLE 195: Miscellaneous arev Math Symbols

♨	\steaming	♦	\vardiamond	♤	\varspade
♧	\varclub	♥	\varheart		

Table 196: Math Alphabets

Font sample	Generating command	Required package
ABCdef123	`\mathrm{ABCdef123}`	*none*
ABCdef123	`\mathit{ABCdef123}`	*none*
ABCdefı23	`\mathnormal{ABCdef123}`	*none*
$\mathcal{ABC}$	`\mathcal{ABC}`	*none*
$\mathscr{ABC}$	`\mathscr{ABC}`	mathrsfs
or	`\mathcal{ABC}`	calrsfs
$\mathcal{ABC}$	`\mathcal{ABC}`	euscript with the mathcal option
or	`\mathscr{ABC}`	euscript with the mathscr option
$\mathpzc{ABCdef123}$	`\mathpzc{ABCdef123}`	*none*; manually defined*
$\mathbb{ABC}$	`\mathbb{ABC}`	amsfonts,§ amssymb, txfonts, or pxfonts
$\mathbf{\mathbb{ABC}}$	`\varmathbb{ABC}`	txfonts or pxfonts
$\mathbb{ABCdef123}$	`\mathbb{ABCdef123}`	bbold or mathbbol†
$\mathbb{ABCdef123}$	`\mathbb{ABCdef123}`	mbboard†
$\mathbb{ABCdef12}$	`\mathbbm{ABCdef12}`	bbm
$\mathbb{ABCdef12}$	`\mathbbmss{ABCdef12}`	bbm
$\mathbb{ABCdef12}$	`\mathbbmtt{ABCdef12}`	bbm
$\mathbb{ABC1}$	`\mathds{ABC1}`	dsfont
$\mathbf{\mathbb{ABC1}}$	`\mathds{ABC1}`	dsfont with the sans option
$\mathfrak{ABCdef123}$	`\mathfrak{ABCdef123}`	eufrak
$\textfrak{ABCdef123}$	`\textfrak{ABCdef123}`	yfonts‡
$\textswab{ABCdef123}$	`\textswab{ABCdef123}`	yfonts‡
$\textgoth{ABCdef123}$	`\textgoth{ABCdef123}`	yfonts‡

* Put "`\DeclareMathAlphabet{\mathpzc}{OT1}{pzc}{m}{it}`" in your document's preamble to make `\mathpzc` typeset its argument in Zapf Chancery. As a similar trick, you can typeset the Calligra font's script " $\mathcal{e}$" (or other calligraphic symbols) in math mode by loading the calligra package and putting "`\DeclareMathAlphabet{\mathcalligra}{T1}{calligra}{m}{n}`" in your document's preamble to make `\mathcalligra` typeset its argument in the Calligra font. (You may also want to specify "`\DeclareFontShape{T1}{calligra}{m}{n}{<->s*[2.2]callig15}{}`" to set Calligra at 2.2 times its design size for a better blend with typical body fonts.)

† The mathbbol package defines some additional blackboard bold characters: parentheses, square brackets, angle brackets, and—if the bbgreekl option is passed to mathbbol—Greek letters. For instance, "$\leqslant[\![(\mathbb{\alpha\beta\gamma})]\!]\geqslant$" is produced by "`\mathbb{\Langle \Lbrack\Lparen\bbalpha\bbbeta\bbgamma\Rparen\Rbrack\Rangle}`".

mbboard extends the blackboard bold symbol set significantly further. It supports not only the Greek alphabet—including "Greek-like" symbols such as `\bbnabla` ("$\mathbb{\nabla}$")—but also *all* punctuation marks, various currency symbols such as `\bbdollar` ("$\mathbb{\$}$") and `\bbeuro` ("$\mathbb{€}$"), and the Hebrew alphabet (e.g., "`\bbfinalnun\bbyod\bbqof \bbpe`" → "$\mathbb{ן י ק ב}$").

‡ As their `\text...` names imply, the fonts provided by the yfonts package are actually text fonts. They are included in Table 196 because they are frequently used in a mathematical context.

[§] An older (i.e., prior to 1991) version of the $\mathcal{AMS}$'s fonts rendered $\mathbb{C}$, $\mathbb{N}$, $\mathbb{R}$, $\mathbb{S}$, and $\mathbb{Z}$ as $\mathbb{C}$, $\mathbb{N}$, $\mathbb{R}$, $\mathbb{S}$, and $\mathbb{Z}$. As some people prefer the older glyphs—much to the $\mathcal{AMS}$'s surprise—and because those glyphs fail to build under modern versions of METAFONT, Berthold Horn uploaded PostScript fonts for the older blackboard-bold glyphs to CTAN, to the `fonts/msym10` directory. As of this writing, however, there are no LaTeX 2_ε packages for utilizing the now-obsolete glyphs.

4 Science and technology symbols

This section lists symbols that are employed in various branches of science and engineering.

Table 197: gensymb Symbols Defined to Work in Both Math and Text Mode

℃	\celsius	µ	\micro	‰	\perthousand
°	\degree	Ω	\ohm		

Table 198: wasysym Electrical and Physical Symbols

∼	\AC	≋	\VHF	∼∼∼	\photon	F	\HF	◠◠◠◠◠◠	\gluon

Table 199: ifsym Pulse Diagram Symbols

⌝⌞	\FallingEdge	⌝⌟⌜	\LongPulseLow	⌝⌜	\PulseLow	⌟⌞	\ShortPulseHigh
⌟⌜⌞	\LongPulseHigh	⌟⌞	\PulseHigh	⌟⌜	\RaisingEdge	⌝⌜	\ShortPulseLow

In addition, within \textifsym{...}, the following codes are valid:

_	l	¯	m	‾	h	‗	d	〈	<	〉	>
‗	L	‾	M	‾	H	‗	D	〈	<<	〉	>>

This enables one to write "\textifsym{mm<DDD>mm}" to get "⟷" or "\textifsym{L|H|L|H|L}" to get "⌞⌜⌟⌜⌟". See also the timing package, which provides a wide variety of pulse-diagram symbols within an environment designed specifically for typesetting pulse diagrams.

Finally, \textifsym supports the display of segmented digits, as would appear on an LCD: "\textifsym{-123.456}" produces "- 123.456". "\textifsym{b}" outputs a blank with the same width as an "8".

Table 200: ar Aspect Ratio Symbol

$\mathscr{R}$	\AR

Table 201: textcomp Text-mode Science and Engineering Symbols

℃	\textcelsius	℧	\textmho	µ	\textmu	Ω	\textohm

Table 202: wasysym Astronomical Symbols

☿	\mercury	♁	\earth	♃	\jupiter	♅	\uranus	♇	\pluto
♀	\venus	♂	\mars	♄	\saturn	♆	\neptune		
⊙	\astrosun	○	\fullmoon	☾	\leftmoon	●	\newmoon	☽	\rightmoon
♈	\aries	♋	\cancer	♎	\libra	≈	\aquarius		
♉	\taurus	♌	\leo	♏	\scorpio	♑	\capricornus		
♊	\gemini	♍	\virgo	♐	\sagittarius	♓	\pisces		
☊	\ascnode	☋	\descnode	☌	\conjunction	☍	\opposition	♈	\vernal

Table 203: marvosym Astronomical Symbols

☿	\Mercury	♁	\Earth	♃	\Jupiter	♅	\Uranus	♇	\Pluto
♀	\Venus	♂	\Mars	♄	\Saturn	♆	\Neptune		
☽	\Moon	☉	\Sun						
♈	\Aries	♋	\Cancer	♎	\Libra	♑	\Capricorn		
♉	\Taurus	♌	\Leo	♏	\Scorpio	♒	\Aquarius		
♊	\Gemini	♍	\Virgo	♐	\Sagittarius	♓	\Pisces		

Note that \Aries ... \Pisces can also be specified with \Zodiac{1} ... \Zodiac{12}.

Table 204: mathabx Astronomical Symbols

☿	\Mercury	⊕	\Earth	♃	\Jupiter	♅	\Uranus	♇	\Pluto
♀	\Venus	♂	\Mars	♄	\Saturn	Ψ	\Neptune	♁	\varEarth
○	\fullmoon	☾	\leftmoon	●	\newmoon	☽	\rightmoon	⊙	\Sun
♈	\Aries	♉	\Taurus	♊	\Gemini				

mathabx also defines \girl as an alias for \Venus, \boy as an alias for \Mars, and \Moon as an alias for \leftmoon.

Table 205: wasysym APL Symbols

⍞	\APLbox	⍚	\APLinv	⋆	\APLstar
⍝	\APLcomment	⍇	\APLleftarrowbox	⍙	\APLup
⍛	\APLdown	⍟	\APLlog	⍐	\APLuparrowbox
⍗	\APLdownarrowbox	¯	\APLminus	⍀	\notbackslash
⍞	\APLinput	⍈	\APLrightarrowbox	⌿	\notslash

TABLE 206: wasysym APL Modifiers

○	\APLcirc{}	∼	\APLnot{}	|	\APLvert{}

TABLE 207: marvosym Computer Hardware Symbols

	\ComputerMouse		\ParallelPort		\SerialInterface
	\Keyboard		\Printer		\SerialPort

TABLE 208: keystroke Computer Keys

Alt	\Alt	Enter	\Enter*	PrtSc	\PrtSc*
AltGr	\AltGr	Esc	\Esc*	→	\RArrow
Break	\Break*	Home	\Home*	↩	\Return
⟵	\BSpace†	Ins	\Ins*	Scroll	\Scroll*
Ctrl	\Ctrl*	←	\LArrow	Shift ⇑	\Shift*
↓	\DArrow	Num	\NumLock		\Spacebar
Del	\Del*	Page ↓	\PgDown*	⇆	\Tab†
End	\End*	Page ↑	\PgUp*	↑	\UArrow

* Changes based on the language option passed to the keystroke package. For example, the german option makes \Del produce " Entf " instead of " Del ".

† These symbols utilize the rotating package and therefore display improperly in most DVI viewers.

The \keystroke command draws a key with an arbitrary label. For example, "\keystroke{F7}" produces " F7 ".

TABLE 209: ascii Control Characters (CP437)

☺	\SOH	◘	\BS	☼	\SI	▬	\SYN	↔	\GS
☻	\STX	○	\HT	►	\DLE	↨	\ETB	▲	\RS
♥	\ETX	◙	\LF	◄	\DCa	↑	\CAN	▼	\US
♦	\EOT	♂	\VT	↕	\DCb	↓	\EM		
♣	\ENQ	♀	\FF	‼	\DCc	→	\SUB		
♠	\ACK	♪	\CR	¶	\DCd	←	\ESC		
•	\BEL	♫	\SO	§	\NAK	∟	\FS		
⌂	\DEL		\NBSP		\NUL	¦	\splitvert		

Code Page 437 (CP437), which was first utilized by the original IBM PC, uses the symbols \SOH through \US to depict ASCII characters 1–31 and \DEL to depict ASCII character 127. The \NUL symbol, not part of CP437, represents ASCII character 0. \NBSP, also not part of CP437, represents a nonbreaking space. \splitvert is merely the "|" character drawn as it was on the IBM PC.

TABLE 210: marvosym Communication Symbols

	\Email	FAX	\fax		\Faxmachine		\Lightning		\Pickup
	\Emailct	FAX	\FAX		\Letter		\Mobilefone		\Telefon

TABLE 211: marvosym Engineering Symbols

	\Beam		\Force		\Octosteel		\RoundedTTsteel
	\Bearing		\Hexasteel		\Rectpipe		\Squarepipe
	\Circpipe		\Lefttorque		\Rectsteel		\Squaresteel
	\Circsteel		\Lineload		\Righttorque		\Tsteel
	\Fixedbearing		\Loosebearing		\RoundedLsteel*		\TTsteel
	\Flatsteel		\Lsteel		\RoundedTsteel*		

* \RoundedLsteel and \RoundedTsteel seem to be swapped, at least in the 2000/05/01 version of marvosym.

TABLE 212: wasysym Biological Symbols

♀	\female	♂	\male

TABLE 213: marvosym Biological Symbols

	\Female		\FemaleMale		\MALE		\Neutral
	\FEMALE		\Hermaphrodite		\Male		
	\FemaleFemale		\HERMAPHRODITE		\MaleMale		

TABLE 214: marvosym Safety-related Symbols

	\Biohazard	CE	\CEsign	Ex	\Explosionsafe		\Radioactivity
XEL	\BSEfree		\Estatically		\Laserbeam	STOP	\Stopsign

TABLE 215: feyn Feynman Diagram Symbols

	`\bigbosonloop`		`\feyn{fu}`		`\feyn{gvs}`		`\feyn{h}`
	`\feyn{a}`		`\feyn{fv}`		`\feyn{gv}`		`\feyn{ms}`
	`\feyn{c}`		`\feyn{f}`		`\feyn{g}`		`\feyn{m}`
	`\feyn{fd}`		`\feyn{glu}`		`\feyn{hd}`		`\feyn{p}`
	`\feyn{fl}`		`\feyn{gl}`		`\feyn{hs}`	×	`\feyn{x}`
	`\feyn{fs}`		`\feyn{gu}`		`\feyn{hu}`		`\smallbosonloop`

All other arguments to the `\feyn` command produce a "?" symbol.

The feyn package provides various commands for composing the preceding symbols into complete Feynman diagrams. See the feyn documentation for examples and additional information.

5 Dingbats

Dingbats are symbols such as stars, arrows, and geometric shapes. They are commonly used as bullets in itemized lists or, more generally, as a means to draw attention to the text that follows.

The pifont dingbat package warrants special mention. Among other capabilities, pifont provides a LaTeX interface to the Zapf Dingbats font (one of the standard 35 PostScript fonts). However, rather than name each of the dingbats individually, pifont merely provides a single `\ding` command, which outputs the character that lies at a given position in the font. The consequence is that the pifont symbols can't be listed by name in this document's index, so be mindful of that fact when searching for a particular symbol.

Table 216: bbding Arrows

➥	\ArrowBoldDownRight	➧	\ArrowBoldRightShort	➦	\ArrowBoldUpRight
➲	\ArrowBoldRightCircled	➠	\ArrowBoldRightStrobe		

Table 217: pifont Arrows

➔	\ding{212}	→	\ding{221}	➦	\ding{230}	⇨	\ding{239}	➶	\ding{249}
→	\ding{213}	➙	\ding{222}	➧	\ding{231}	⇨	\ding{241}	➷	\ding{250}
↔	\ding{214}	➛	\ding{223}	➨	\ding{232}	➲	\ding{242}	➸	\ding{251}
↕	\ding{215}	➠	\ding{224}	⇨	\ding{233}	➻	\ding{243}	➹	\ding{252}
➘	\ding{216}	➨	\ding{225}	⇨	\ding{234}	➴	\ding{244}	➺	\ding{253}
➙	\ding{217}	➢	\ding{226}	⇨	\ding{235}	➵	\ding{245}	➾	\ding{254}
➚	\ding{218}	➢	\ding{227}	⇨	\ding{236}	➶	\ding{246}		
➛	\ding{219}	➤	\ding{228}	⇨	\ding{237}	➴	\ding{247}		
➔	\ding{220}	➥	\ding{229}	⇨	\ding{238}	➵	\ding{248}		

Table 218: universal Arrows

⇀	\bauarrow	⇨	\bauwhitearrow

Table 219: marvosym Scissors

✁	\Cutleft	✂	\Cutright	✁	\Leftscissors
---	\Cutline	---	\Kutline	✂	\Rightscissors

Table 220: bbding Scissors

✃	\ScissorHollowLeft	✁	\ScissorLeftBrokenTop
✄	\ScissorHollowRight	✂	\ScissorRight
✁	\ScissorLeft	✂	\ScissorRightBrokenBottom
✁	\ScissorLeftBrokenBottom	✂	\ScissorRightBrokenTop

Table 221: pifont Scissors

✁ \ding{33} ✂ \ding{34} ✃ \ding{35} ✄ \ding{36}

Table 222: dingbat Pencils

 \largepencil  \smallpencil

Table 223: bbding Pencils and Nibs

	\NibLeft		\PencilLeft		\PencilRightDown
	\NibRight		\PencilLeftDown		\PencilRightUp
	\NibSolidLeft		\PencilLeftUp		
	\NibSolidRight		\PencilRight		

Table 224: pifont Pencils and Nibs

✎ \ding{46} ✏ \ding{47} ✐ \ding{48} ✑ \ding{49} ✒ \ding{50}

Table 225: dingbat Fists

	\leftpointright		\rightpointleft		\rightpointright
	\leftthumbsdown		\rightthumbsdown		
	\leftthumbsup		\rightthumbsup		

Table 226: bbding Fists

	\HandCuffLeft		\HandCuffRightUp		\HandPencilLeft
	\HandCuffLeftUp		\HandLeft		\HandRight
	\HandCuffRight		\HandLeftUp		\HandRightUp

Table 227: pifont Fists

☛ \ding{42} ☞ \ding{43} ✌ \ding{44} ✍ \ding{45}

TABLE 228: bbding Crosses and Plusses

✝	\Cross	✞	\CrossOpenShadow	✙	\PlusOutline
✟	\CrossBoldOutline	✝	\CrossOutline	✛	\PlusThinCenterOpen
✣	\CrossClowerTips	✚	\Plus		
✠	\CrossMaltese	✜	\PlusCenterOpen		

TABLE 229: pifont Crosses and Plusses

✙	\ding{57}	✛	\ding{59}	✝	\ding{61}	✟	\ding{63}
✚	\ding{58}	✜	\ding{60}	✞	\ding{62}	✠	\ding{64}

TABLE 230: bbding Xs and Check Marks

✓	\Checkmark	╳	\XSolid	✗	\XSolidBrush
✔	\CheckmarkBold	✖	\XSolidBold		

TABLE 231: pifont Xs and Check Marks

✓	\ding{51}	✕	\ding{53}	✗	\ding{55}
✔	\ding{52}	✖	\ding{54}	✘	\ding{56}

TABLE 232: wasysym Xs and Check Marks

☑	\CheckedBox	□	\Square	☒	\XBox

TABLE 233: universal Xs

✖	\baucross

Table 234: pifont Circled Numbers

①	\ding{172}	❶	\ding{182}	①	\ding{192}	❶	\ding{202}
②	\ding{173}	❷	\ding{183}	②	\ding{193}	❷	\ding{203}
③	\ding{174}	❸	\ding{184}	③	\ding{194}	❸	\ding{204}
④	\ding{175}	❹	\ding{185}	④	\ding{195}	❹	\ding{205}
⑤	\ding{176}	❺	\ding{186}	⑤	\ding{196}	❺	\ding{206}
⑥	\ding{177}	❻	\ding{187}	⑥	\ding{197}	❻	\ding{207}
⑦	\ding{178}	❼	\ding{188}	⑦	\ding{198}	❼	\ding{208}
⑧	\ding{179}	❽	\ding{189}	⑧	\ding{199}	❽	\ding{209}
⑨	\ding{180}	❾	\ding{190}	⑨	\ding{200}	❾	\ding{210}
⑩	\ding{181}	❿	\ding{191}	⑩	\ding{201}	❿	\ding{211}

pifont (part of the psnfss package) provides a `dingautolist` environment which resembles `enumerate` but uses circled numbers as bullets.[3] See the psnfss documentation for more information.

Table 235: wasysym Stars

✡	\davidsstar	✳	\hexstar	✳	\varhexstar

Table 236: bbding Stars, Flowers, and Similar Shapes

✻	\Asterisk	✿	\FiveFlowerPetal	✣	\JackStar
✱	\AsteriskBold	★	\FiveStar	✤	\JackStarBold
✲	\AsteriskCenterOpen	☆	\FiveStarCenterOpen	✾	\SixFlowerAlternate
✽	\AsteriskRoundedEnds	✯	\FiveStarConvex	❋	\SixFlowerAltPetal
✳	\AsteriskThin	✰	\FiveStarLines	✼	\SixFlowerOpenCenter
✴	\AsteriskThinCenterOpen	☆	\FiveStarOpen	❀	\SixFlowerPetalDotted
✡	\DavidStar	✪	\FiveStarOpenCircled	✻	\SixFlowerPetalRemoved
✸	\DavidStarSolid	✭	\FiveStarOpenDotted	❁	\SixFlowerRemovedOpenPetal
✻	\EightAsterisk	✭	\FiveStarOutline	✶	\SixStar
❀	\EightFlowerPetal	✰	\FiveStarOutlineHeavy	✺	\SixteenStarLight
✼	\EightFlowerPetalRemoved	☆	\FiveStarShadow	❄	\Snowflake
✷	\EightStar	✢	\FourAsterisk	❆	\SnowflakeChevron
✸	\EightStarBold	❀	\FourClowerOpen	❄	\SnowflakeChevronBold
✵	\EightStarConvex	✤	\FourClowerSolid	✻	\Sparkle
✴	\EightStarTaper	✦	\FourStar	✼	\SparkleBold
❀	\FiveFlowerOpen	✧	\FourStarOpen	✹	\TwelweStar

[3] In fact, `dingautolist` can use any set of consecutive Zapf Dingbats symbols.

TABLE 237: pifont Stars, Flowers, and Similar Shapes

✡	\ding{65}	✪	\ding{74}	✳	\ding{83}	✻	\ding{92}	❋	\ding{101}
✢	\ding{66}	✫	\ding{75}	✴	\ding{84}	✼	\ding{93}	❁	\ding{102}
✣	\ding{67}	✬	\ding{76}	✵	\ding{85}	✽	\ding{94}	✺	\ding{103}
✤	\ding{68}	✭	\ding{77}	✶	\ding{86}	✿	\ding{95}	❇	\ding{104}
✥	\ding{69}	✮	\ding{78}	✷	\ding{87}	❀	\ding{96}	❈	\ding{105}
✦	\ding{70}	✯	\ding{79}	✸	\ding{88}	❁	\ding{97}	✹	\ding{106}
✧	\ding{71}	✰	\ding{80}	✹	\ding{89}	✪	\ding{98}	❉	\ding{107}
★	\ding{72}	✱	\ding{81}	✺	\ding{90}	❊	\ding{99}		
☆	\ding{73}	✲	\ding{82}	❇	\ding{91}	❈	\ding{100}		

TABLE 238: wasysym Geometric Shapes

⬡	\hexagon	◯	\octagon	⬠	\pentagon	⬡	\varhexagon

TABLE 239: MnSymbol Geometric Shapes

★	\filledlargestar	◇	\largediamond	☆	\largestar	◊	\smalllozenge
⧫	\filledlozenge	◊	\largelozenge	✡	\largestarofdavid		
⧫	\filledmedlozenge	☆	\largepentagram	◊	\medlozenge		
◯	\largecircle	□	\largesquare	✡	\medstarofdavid		

MnSymbol defines \bigcirc as a synonym for \largecircle; \bigstar as a synonym for \filledlargestar; \lozenge as a synonym for \medlozenge; and, \blacklozenge as a synonym for \filledmedlozenge.

Table 240: ifsym Geometric Shapes

○	\BigCircle	▶	\FilledBigTriangleRight	○	\SmallCircle
×	\BigCross	▲	\FilledBigTriangleUp	×	\SmallCross
◇	\BigDiamondshape	●	\FilledCircle	◇	\SmallDiamondshape
—	\BigHBar	◈	\FilledDiamondShadowA	–	\SmallHBar
◈	\BigLowerDiamond	◈	\FilledDiamondShadowC	◈	\SmallLowerDiamond
◈	\BigRightDiamond	◆	\FilledDiamondshape	◈	\SmallRightDiamond
□	\BigSquare	●	\FilledSmallCircle	□	\SmallSquare
▽	\BigTriangleDown	◆	\FilledSmallDiamondshape	▽	\SmallTriangleDown
◁	\BigTriangleLeft	■	\FilledSmallSquare	◁	\SmallTriangleLeft
▷	\BigTriangleRight	▼	\FilledSmallTriangleDown	▷	\SmallTriangleRight
△	\BigTriangleUp	◀	\FilledSmallTriangleLeft	△	\SmallTriangleUp
—	\BigVBar	▶	\FilledSmallTriangleRight	|	\SmallVBar
○	\Circle	▲	\FilledSmallTriangleUp	↓	\SpinDown
×	\Cross	■	\FilledSquare	↑	\SpinUp
◈	\DiamondShadowA	■	\FilledSquareShadowA	□	\Square
◈	\DiamondShadowB	■	\FilledSquareShadowC	□	\SquareShadowA
◈	\DiamondShadowC	▼	\FilledTriangleDown	□	\SquareShadowB
◇	\Diamondshape	◀	\FilledTriangleLeft	□	\SquareShadowC
●	\FilledBigCircle	▶	\FilledTriangleRight	▽	\TriangleDown
◆	\FilledBigDiamondshape	▲	\FilledTriangleUp	◁	\TriangleLeft
■	\FilledBigSquare	—	\HBar	▷	\TriangleRight
▼	\FilledBigTriangleDown	◈	\LowerDiamond	△	\TriangleUp
◀	\FilledBigTriangleLeft	◈	\RightDiamond	|	\VBar

The ifsym documentation points out that one can use `\rlap` to combine some of the above into useful, new symbols. For example, `\BigCircle` and `\FilledSmallCircle` combine to give "◉". Likewise, `\Square` and `\Cross` combine to give "⊠". See Section 7.3 for more information about constructing new symbols out of existing symbols.

Table 241: bbding Geometric Shapes

○	\CircleShadow	▌	\Rectangle	□	\SquareShadowTopLeft
●	\CircleSolid	▌	\RectangleBold	□	\SquareShadowTopRight
◆	\DiamondSolid	|	\RectangleThin	■	\SquareSolid
⬭	\Ellipse	□	\Square	▼	\TriangleDown
⬭	\EllipseShadow	□	\SquareCastShadowBottomRight	▲	\TriangleUp
⬬	\EllipseSolid	□	\SquareCastShadowTopLeft		
◖	\HalfCircleLeft	□	\SquareCastShadowTopRight		
◗	\HalfCircleRight	□	\SquareShadowBottomRight		

Table 242: pifont Geometric Shapes

●	\ding{108}	❑	\ding{111}	❒	\ding{114}	◆	\ding{117}	❙	\ding{121}
❍	\ding{109}	❒	\ding{112}	▲	\ding{115}	◗	\ding{119}	▮	\ding{122}
■	\ding{110}	❑	\ding{113}	▼	\ding{116}	|	\ding{120}		

Table 243: universa Geometric Shapes

●	\baucircle	■	\bausquare	▲	\bautriangle

Table 244: universal Geometric Shapes

⊡	\baucircle	●	\bauhole	■	\bausquare
◉	\baueclipse	●	\baupunct	▲	\bautriangle

Table 245: igo Go Stones

◎	\blackstone[\igocircle]	◎	\whitestone[\igocircle]
⊗	\blackstone[\igocross]	⊗	\whitestone[\igocross]
●	\blackstone[\igonone]	○	\whitestone[\igonone]
▣	\blackstone[\igosquare]	▣	\whitestone[\igosquare]
◬	\blackstone[\igotriangle]	◬	\whitestone[\igotriangle]

In addition to the symbols shown above, igo's \blackstone and \whitestone commands accept numbers from 1 to 99 and display them circled as ❶, ❷, ❸, … ⑨⑨ and ①, ②, ③, … ⑨⑨, respectively.

The igo package is intended to typeset Go boards (goban). See the igo documentation for more information.

Table 246: manfnt Dangerous Bend Symbols

 \dbend  \lhdbend  \reversedvideodbend

Note that these symbols descend far beneath the baseline. manfnt also defines non-descending versions, which it calls, correspondingly, \textdbend, \textlhdbend, and \textreversedvideodbend.

Table 247: skull Symbols

 \skull

Table 248: Non-Mathematical mathabx Symbols

⸸ \rip

TABLE 249: marvosym Information Symbols

	\Bicycle		\Football		\Pointinghand
	\Checkedbox		\Gentsroom		\Wheelchair
	\Clocklogo		\Industry		\Writinghand
	\Coffeecup		\Info		
	\Crossedbox		\Ladiesroom		

TABLE 250: Miscellaneous dingbat Dingbats

	\anchor		\eye		\Sborder
	\carriagereturn		\filledsquarewithdots		\squarewithdots
	\checkmark		\satellitedish		\Zborder

TABLE 251: Miscellaneous bbding Dingbats

	\Envelope		\Peace		\PhoneHandset		\SunshineOpenCircled
	\OrnamentDiamondSolid		\Phone		\Plane		\Tape

TABLE 252: Miscellaneous pifont Dingbats

	\ding{37}		\ding{40}		\ding{164}		\ding{167}		\ding{171}
	\ding{38}		\ding{41}		\ding{165}		\ding{168}		\ding{169}
	\ding{39}		\ding{118}		\ding{166}		\ding{170}		

6 Other symbols

The following are all the symbols that didn't fit neatly or unambiguously into any of the previous sections. (Do weather symbols belong under "Science and technology"? Should dice be considered "mathematics"?) While some of the tables contain clearly related groups of symbols (e.g., musical notes), others represent motley assortments of whatever the font designer felt like drawing.

Table 253: textcomp Genealogical Symbols

⋆	\textborn	⚮	\textdivorced	⚭	\textmarried
†	\textdied		\textleaf		

Table 254: wasysym General Symbols

	\ataribox	◷	\clock	◀	\LEFTarrow	☺	\smiley
	\bell	⌀	\diameter	ϟ	\lightning	☼	\sun
☻	\blacksmiley	▼	\DOWNarrow	☎	\phone	▲	\UParrow
⋈	\Bowtie	☹	\frownie	➪	\pointer	⌑	\wasylozenge
¦	\brokenvert	⦸	\invdiameter	⌕	\recorder		
✓	\checked	✠	\kreuz	▶	\RIGHTarrow		

Table 255: wasysym Circles

●	\CIRCLE	◐	\LEFTcircle	◑	\RIGHTcircle	↻	\rightturn
○	\Circle	◖	\Leftcircle	◗	\Rightcircle		
◖	\LEFTCIRCLE	◗	\RIGHTCIRCLE	↺	\leftturn		

Table 256: wasysym Musical Symbols

♪	\eighthnote	𝅗𝅥	\halfnote	♫	\twonotes	𝅝	\fullnote	♩	\quarternote

See also \flat, \sharp, and \natural (Table 184 on page 67).

Table 257: arev Musical Symbols

♩	\quarternote	♪	\eighthnote	♬	\sixteenthnote

See also \flat, \sharp, and \natural (Table 184 on page 67).

TABLE 258: harmony Musical Symbols

	\AAcht		\DDohne		\Halb		\SechBR	>	\VM
	\Acht		\Dohne		\HaPa		\SechBr		\Zwdr
	\AchtBL		\Ds	.	\Pu		\SePa		\ZwPa
	\AchtBR		\DS		\Sech	<	\UB		
	\AcPa		\Ganz		\SechBL		\Vier		
	\DD		\GaPa		\SechBl		\ViPa		

The musixtex package must be installed to use harmony.

TABLE 259: harmony Musical Accents

Âa	\Ferli{A}\Ferli{a}*	Aa	\Ohne{A}\Ohne{a}*
Âa	\Fermi{A}\Fermi{a}	A a	\Umd{A}\Umd{a}*
(A)(a)	\Kr{A}\Kr{a}		

* These symbols take an optional argument which shifts the accent either horizontally or vertically (depending on the command) by the given distance.

In addition to the accents shown above, \HH is a special accent command which accepts five period-separated characters and typesets them such that "\HH.X.a.b.c.d." produces "X_a^b". All arguments except the first can be omitted: "\HH.X....." produces "X". \Takt takes two arguments and composes them into a musical time signature. For example, "\Takt{12}{8}" produces "$\frac{12}{8}$". As two special cases, "\Takt{c}{0}" produces "$\mathbf{C}$" and "\Takt{c}{1}" produces "¢".

The musixtex package must be installed to use harmony.

TABLE 260: Miscellaneous manfnt Symbols

	\manboldkidney		\manpenkidney
	\manconcentriccircles		\manquadrifolium
	\manconcentricdiamond		\manquartercircle
	\mancone		\manrotatedquadrifolium
	\mancube		\manrotatedquartercircle
	\manerrarrow		\manstar
	\manfilledquartercircle		\mantiltpennib
	\manhpennib	▼	\mantriangledown
	\manimpossiblecube	▶	\mantriangleright
	\mankidney	▲	\mantriangleup
	\manlhpenkidney		\manvpennib

TABLE 261: marvosym Navigation Symbols

▶	\Forward	▼	\MoveDown	⏮	\RewindToIndex	⤒	\ToTop
⏭	\ForwardToEnd	▲	\MoveUp	⏮	\RewindToStart		
⏭	\ForwardToIndex	◀	\Rewind	⤓	\ToBottom		

TABLE 262: marvosym Laundry Symbols

	\AtForty		\Handwash		\ShortNinetyFive
	\AtNinetyFive		\IroningI		\ShortSixty
	\AtSixty		\IroningII		\ShortThirty
△	\Bleech		\IroningIII		\SpecialForty
Ⓐ	\CleaningA		\NoBleech		\Tumbler
Ⓕ	\CleaningF		\NoChemicalCleaning		\WashCotton
Ⓕ	\CleaningFF		\NoIroning		\WashSynthetics
Ⓟ	\CleaningP		\NoTumbler		\WashWool
Ⓟ	\CleaningPP		\ShortFifty		
	\Dontwash		\ShortForty		

TABLE 263: Other marvosym Symbols

☥	\Ankh	✝	\Cross	♡	\Heart	☺	\Smiley
	\Bat		\FHBOlogo		\MartinVogel		\Womanface
	\Bouquet		\FHBOLOGO		\Mundus		\Yinyang
	\Celtcross		\Frowny	@	\MVAt		
Ⓐ	\CircledA		\FullFHBO	➔	\MVRightarrow		

TABLE 264: Miscellaneous universa Symbols

\bauforms \bauhead

TABLE 265: Miscellaneous universal Symbols

	\baudash		\bauforms		\bauquarter		\varQ
	\bauequal		\bauhead		\bauquestion		
	\bauface		\bauplus		\bauwindow		

Table 266: ifsym Weather Symbols

	\Cloud		\Hail		\Sleet		\WeakRain
	\FilledCloud		\HalfSun		\Snow		\WeakRainCloud
	\FilledRainCloud		\Lightning		\SnowCloud		\FilledSnowCloud
	\FilledSunCloud		\NoSun		\Sun		
	\FilledWeakRainCloud		\Rain		\SunCloud		
	\Fog		\RainCloud		\ThinFog		

In addition, \Thermo{0}...\Thermo{6} produce thermometers that are between 0/6 and 6/6 full of mercury:

Similarly, \wind{⟨*sun*⟩}{⟨*angle*⟩}{⟨*strength*⟩} will draw wind symbols with a given amount of sun (0–4), a given angle (in degrees), and a given strength in km/h (0–100). For example, \wind{0}{0}{0} produces "", \wind{2}{0}{0} produces "", and \wind{4}{0}{100} produces "".

Table 267: ifsym Alpine Symbols

	\SummitSign		\Summit		\SurveySign		\HalfFilledHut
	\StoneMan		\Mountain		\Joch		\VarSummit
	\Hut		\IceMountain		\Flag		
	\FilledHut		\VarMountain		\VarFlag		
	\Village		\VarIceMountain		\Tent		

Table 268: ifsym Clocks

	\Interval		\StopWatchStart		\VarClock		\Wecker
	\StopWatchEnd		\Taschenuhr		\VarTaschenuhr		

ifsym also exports a \showclock macro. \showclock{⟨*hours*⟩}{⟨*minutes*⟩} outputs a clock displaying the corresponding time. For instance, "\showclock{5}{40}" produces "". ⟨*hours*⟩ must be an integer from 0 to 11, and ⟨*minutes*⟩ must be an integer multiple of 5 from 0 to 55.

TABLE 269: Other ifsym Symbols

❖	\FilledSectioningDiamond	✉	\Letter	☢	\Radiation
🔥	\Fire	🖃	\PaperLandscape	❖	\SectioningDiamond
✕	\Irritant	🖹	\PaperPortrait	☎	\Telephone
|	\StrokeOne	‖	\StrokeThree	𝍸	\StrokeFive
‖	\StrokeTwo	𝍷	\StrokeFour		

In addition, \Cube{1}...\Cube{6} produce dice with the corresponding number of spots: ⚀ ⚁ ⚂ ⚃ ⚄ ⚅

TABLE 270: epsdice Dice

⚀	\epsdice{1}	⚂	\epsdice{3}	⚄	\epsdice{5}
⚁	\epsdice{2}	⚃	\epsdice{4}	⚅	\epsdice{6}

The epsdice package does not provide a font but rather an interface to a set of graphics drawn in Encapsulated PostScript. Consequently, epsdice does not work with pdfLaTeX.

TABLE 271: skak Chess Informator Symbols

∓	\bbetter	♊	\doublepawns	N	\novelty	R	\various
−+	\bdecisive	⊥	\ending	□	\onlymove	±	\wbetter
⌓	\betteris	=	\equal	◘	\opposbishops	+−	\wdecisive
◘	\bishoppair	‖	\etc	♁	\passedpawn	×	\weakpt
∓	\bupperhand	⇔	\file	≪	\qside	⌟	\with
⊞	\centre	≫	\kside	■	\samebishops	→	\withattack
RR	\comment	×	\markera	—	\see	△	\withidea
∞	\compensation	O	\markerb	○···○	\seppawns	↑	\withinit
⇆	\counterplay	#	\mate	⊕	\timelimit	∟	\without
↻	\devadvantage	>	\morepawns	∞	\unclear	±	\wupperhand
⇗	\diagonal	○	\moreroom	○○	\unitedpawns	⊙	\zugzwang

The preceding symbols are merely the named informator symbol. skak can typeset many more chess-related symbols, including those for all of the pieces (♔♕♖♗♘♙/♚♛♜♝♞♟), but only in the context of moves and boards, not as individual, named LaTeX symbols.

Table 272: metre Metrical Symbols

×	\a	⏜	\bBm	‖	\cc	⏟	\Mbb	⋮	\Pppp	⊗	\t
◡	\B	⏜	\bbm	‖	\Ccc	⏟	\mbbx	⋮	\pppp	⎽	\tsbm
◡	\b	⏜	\Bbm	_	\m	○○	\oo	⋮	\Ppppp	⎽	\tsmb
◡	\Bb	⏜	\bbmb	´	\M	.	\p	⋮	\ppppp	⎽	\tsmm
◡	\BB	⏜	\bbmx	×	\ma	+	\pm	⎽	\ps	⋮	\vppm
◡	\bb	⏜	\bm	⏟	\Mb	:	\pp	:	\pxp	⋮	\vpppm
◡	\bB	⏜	\Bm	⊃	\mb	:	\Pp	:	\Pxp	::	\x
⏜	\bba	|	\c	⏟	\mBb	¨	\ppm	~	\R		
⏜	\bbb	|	\C	⏟	\mbB	⋮	\ppp	~	\r		
⏜	\BBm	‖	\Cc	⏟	\mbb	⋮	\Ppp	⊗	\T		

The preceding symbols are valid only within the argument to the `metre` command.

Table 273: metre Small and Large Metrical Symbols

÷	\anaclasis	÷	\Anaclasis
<	\antidiple	<	\Antidiple
≮	\antidiple*	≮	\Antidiple*
⊃	\antisigma	⊃	\Antisigma
※	\asteriscus	※	\Asteriscus
^	\catalexis	^	\Catalexis
>	\diple	>	\Diple
≯	\diple*	≯	\Diple*
—	\obelus	—	\Obelus
÷	\obelus*	÷	\Obelus*
~	\respondens	~	\Respondens
⊗	\terminus	⊗	\Terminus
⊕	\terminus*	⊕	\Terminus*

TABLE 274: phaistos Symbols from the Phaistos Disk

	\PHarrow		\PHeagle		\PHplumedHead
	\PHbee		\PHflute		\PHram
	\PHbeehive		\PHgaunlet		\PHrosette
	\PHboomerang		\PHgrater		\PHsaw
	\PHbow		\PHhelmet		\PHshield
	\PHbullLeg		\PHhide		\PHship
	\PHcaptive		\PHhorn		\PHsling
	\PHcarpentryPlane		\PHlid		\PHsmallAxe
	\PHcat		\PHlily		\PHstrainer
	\PHchild		\PHmanacles		\PHtattooedHead
	\PHclub		\PHmattock		\PHtiara
	\PHcolumn		\PHoxBack		\PHtunny
	\PHcomb		\PHpapyrus		\PHvine
	\PHdolium		\PHpedestrian		\PHwavyBand
	\PHdove		\PHplaneTree		\PHwoman

TABLE 275: protosem Proto-Semitic Characters

	\Aaleph		\AAhe		\Akaph		\Asamekh		\AAresh
	\AAaleph		\Azayin		\AAkaph		\Ape		\Ashin
	\Abeth		\Avav		\Alamed		\AApe		\Ahelmet
	\AAbeth		\Aheth		\AAlamed		\Asade		\AAhelmet
	\Agimel		\AAheth		\Amem		\AAsade		\Atav
	\Adaleth		\Ateth		\Anun		\Aqoph		
	\AAdaleth		\Ayod		\Aayin		\AAqoph		
	\Ahe		\AAyod		\AAayin		\Aresh		

The protosem package defines abbreviated control sequences for each of the above. In addition, single-letter shortcuts can be used within the argument to the \textproto command (e.g., "\textproto{Pakyn}" produces ""). See the protosem documentation for more information.

TABLE 276: hieroglf Hieroglyphics

	\HA		\HI		\Hn		\HT
	\Ha		\Hi		\HO		\Ht
	\HB		\Hibl		\Ho		\Htongue
	\Hb		\Hibp		\Hp		\HU
	\Hc		\Hibs		\HP		\Hu
	\HC		\Hibw		\Hplural		\HV
	\HD		\HJ		\Hplus		\Hv
	\Hd		\Hj		\HQ		\Hvbar
	\Hdual		\Hk		\Hq		\Hw
	\He		\HK		\Hquery		\HW
	\HE		\HL		\HR		\HX
	\Hf		\Hl		\Hr		\Hx
	\HF		\Hm		\Hs		\HY
	\HG		\HM		\HS		\Hy
	\Hg		\Hman		\Hscribe		\Hz
	\Hh		\Hms		\Hslash		\HZ
	\HH		\HN		\Hsv		
	\Hone		\Hhundred		\HXthousand		\Hmillion
	\Hten		\Hthousand		\HCthousand		

The hieroglf package defines alternate control sequences and single-letter shortcuts for each of the above which can be used within the argument to the `\textpmhg` command (e.g., "`\textpmhg{Pakin}`" produces ""). See the hieroglf documentation for more information.

TABLE 277: dictsym Dictionary Symbols

	\dsaeronautical		\dscommercial		\dsmedical
	\dsagricultural		\dsheraldical		\dsmilitary
	\dsarchitectural		\dsjuridical		\dsrailways
	\dsbiological		\dsliterary		\dstechnical
	\dschemical		\dsmathematical		

TABLE 278: simpsons Characters from *The Simpsons*

 \Bart  \Homer  \Maggie  \SNPP

 \Burns  \Lisa  \Marge

The location of the characters' pupils can be controlled with the `\Goofy` command. See *A METAFONT of 'Simpsons' characters* [Che97] for more information. Also, each of the above can be prefixed with `\Left` to make the character face left instead of right:

 `\Left\Bart`

TABLE 279: staves Magical Staves

 \staveI
 \staveII
 \staveIII
 \staveIV
 \staveV
 \staveVI
 \staveVII
 \staveVIII
 \staveIX
 \staveX
 \staveXI
 \staveXII
 \staveXIII

 \staveXXIV
 \staveXXV
 \staveXXVI
 \staveXXVII
 \staveXXVIII
 \staveXXIX
 \staveXXX
 \staveXXXI
 \staveXXXII
 \staveXXXIII
 \staveXXXIV
 \staveXXXV
 \staveXXXVI

 \staveXLVII
 \staveXLVIII
 \staveXLIX
 \staveL
 \staveLI
 \staveLII
 \staveLIII
 \staveLIV
 \staveLV
 \staveLVI
 \staveLVII
 \staveLVIII
 \staveLIX

(continued on next page)

(continued from previous page)

	`\staveXIV`		`\staveXXXVII`		`\staveLX`
	`\staveXV`		`\staveXXXVIII`		`\staveLXI`
	`\staveXVI`		`\staveXXXIX`		`\staveLXII`
	`\staveXVII`		`\staveXL`		`\staveLXIII`
	`\staveXVIII`		`\staveXLI`		`\staveLXIV`
	`\staveXIX`		`\staveXLII`		`\staveLXV`
	`\staveXX`		`\staveXLIII`		`\staveLXVI`
	`\staveXXI`		`\staveXLIV`		`\staveLXVII`
	`\staveXXII`		`\staveXLV`		`\staveLXVIII`
	`\staveXXIII`		`\staveXLVI`		

The meanings of these symbols are described on the Web site for the Museum of Icelandic Sorcery and Witchcraft at `http://www.galdrasyning.is/index.php?option=com_content&task=category&sectionid=5&id=18&Itemid=60` (TinyURL: `http://tinyurl.com/25979m`). For example, `\staveL` (“  ”) is intended to ward off ghosts and evil spirits.

7 Additional Information

Unlike the previous sections of this document, Section 7 does not contain new symbol tables. Rather, it provides additional help in using the Comprehensive LaTeX Symbol List. First, it draws attention to symbol names used by multiple packages. Next, it provides some guidelines for finding symbols and gives some examples regarding how to construct missing symbols out of existing ones. Then, it comments on the spacing surrounding symbols in math mode. After that, it presents an ASCII and Latin 1 quick-reference guide, showing how to enter all of the standard ASCII/Latin 1 symbols in LaTeX. And finally, it lists some statistics about this document itself.

7.1 Symbol Name Clashes

Unfortunately, a number of symbol names are not unique; they appear in more than one package. Depending on how the symbols are defined in each package, LaTeX will either output an error message or replace an earlier-defined symbol with a later-defined symbol. Table 280 presents a selection of name clashes that appear in this document.

Using multiple symbols with the same name in the same document—or even merely loading conflicting symbol packages—can be tricky but, as evidenced by the existence of Table 280, not impossible. The general procedure is to load the first package, rename the conflicting symbols, and then load the second package. Examine the LaTeX source for this document (`symbols.tex`) for examples of this and other techniques for handling symbol conflicts. Note that `symbols.tex`'s `\savesymbol` and `\restoresymbol` macros have been extracted into the savesym package, which can be downloaded from CTAN.

txfonts and pxfonts redefine a huge number of symbols—essentially, all of the symbols defined by latexsym, textcomp, the various $\mathcal{AMS}$ symbol sets, and LaTeX 2_ε itself. Similarly, mathabx redefines a vast number of math symbols in an attempt to improve their look. The txfonts, pxfonts, and mathabx conflicts are not listed in Table 280 because they are designed to be compatible with the symbols they replace. Table 281 on page 97 illustrates what "compatible" means in this context.

To use the new txfonts/pxfonts symbols without altering the document's main font, merely reset the default font families back to their original values after loading one of those packages:

```
\renewcommand\rmdefault{cmr}
\renewcommand\sfdefault{cmss}
\renewcommand\ttdefault{cmtt}
```

7.2 Resizing symbols

Mathematical symbols listed in this document as "variable-sized" are designed to stretch vertically. Each variable-sized symbol comes in one or more basic sizes plus a variation comprising both stretchable and nonstretchable segments. Table 282 on page 97 presents the symbols `\}` and `\uparrow` in their default size, in their `\big`, `\Big`, `\bigg`, and `\Bigg` sizes, in an even larger size achieved using `\left`/`\right`, and—for contrast—in a large size achieved by changing the font size using LaTeX 2_ε's `\fontsize` command. Because the symbols shown belong to the Computer Modern family, the type1cm package needs to be loaded to support font sizes larger than 24.88 pt.

Note how `\fontsize` makes the symbol wider and thicker. (The graphicx package's `\scalebox` or `\resizebox` commands would produce a similar effect.) Also, the `\fontsize`-enlarged symbol is vertically centered relative to correspondingly large text, unlike the symbols enlarged using `\big` et al. or `\left`/`\right`, which all use the same math axis regardless of symbol size. However, `\fontsize` is not limited to mathematical delimiters. Also, `\scalebox` and `\resizebox` are more robust to poorly composed symbols (e.g., two symbols made to overlap by backspacing a fixed distance) but do not work with every TeX backend and will produce jagged symbols when scaling a bitmapped font.

All variable-sized delimiters are defined (by the corresponding `.tfm` file) in terms of up to five segments, as illustrated by Figure 1 on page 97. The top, middle, and bottom segments are of a fixed size. The top-middle and middle-bottom segments (which are constrained to be the same character) are repeated as many times as necessary to achieve the desired height.

TABLE 280: Symbol Name Clashes

Symbol	LaTeX 2ε	AMS	stmaryrd	wasysym	mathabx	marvosym	bbding	ifsym	dingbat	wsuipa
\baro			ϕ							ɵ
\bigtriangledown	▽		▽							
\bigtriangleup	△		△							
\checkmark		✓							✓	
\Circle				○				○		
\Cross						†	✝	✕		
\ggg		⋙			⩾					
\Letter						✉		✉		
\lightning			↯	↯						
\Lightning						🗲		🗲		
\lll		⋘			⩽					
\Square				□			□	□		
\Sun					⊙	🌣		☼		
\TriangleDown							▼	▽		
\TriangleUp							▲	△		

TABLE 281: Example of a Benign Name Clash

Symbol	Default (Computer Modern)	txfonts (Times Roman)
`R`	ℝ	ℝ
`\textrecipe`	℞	℞

TABLE 282: Sample resized delimiters

Symbol	Default size	`\big`	`\Big`	`\bigg`	`\Bigg`	`\left` / `\right`	`\fontsize`
`\}`	}	}	}	}	}	}	}
`\uparrow`	↑	↑	↑	↑	↑	↑	↑

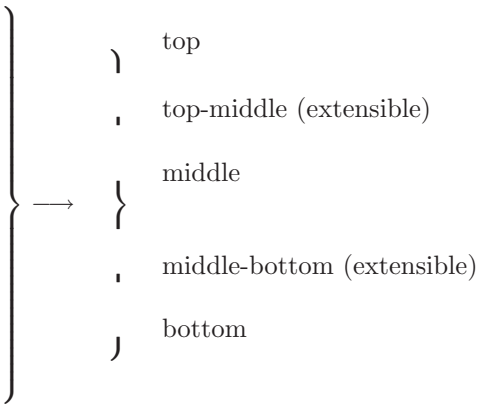


Figure 1: Implementation of variable-sized delimiters

7.3 Where can I find the symbol for . . . ?

If you can't find some symbol you're looking for in this document, there are a few possible explanations:

- The symbol isn't intuitively named. As a few examples, the ifsym command to draw dice is "`\Cube`"; a plus sign with a circle around it ("exclusive or" to computer engineers) is "`\oplus`"; and lightning bolts in fonts designed by German speakers may have "blitz" in their names as in the ulsy package. The moral of the story is to be creative with synonyms when searching the index.
- The symbol is defined by some package that I overlooked (or deemed unimportant). If there's some symbol package that you think should be included in the Comprehensive LaTeX Symbol List, please send me e-mail at the address listed on the title page.
- The symbol isn't defined in any package whatsoever.

Even in the last case, all is not lost. Sometimes, a symbol exists in a font, but there is no LaTeX binding for it. For example, the PostScript Symbol font contains a "↵" symbol, which may be useful for representing a carriage return, but there is no package (as far as I know) for accessing that symbol. To produce an unnamed symbol, you need to switch to the font explicitly with LaTeX 2_ε's low-level font commands [LaT00] and use TeX's primitive `\char` command [Knu86a] to request a specific character number in the font.[4] In fact, `\char` is not strictly necesssary; the character can often be entered symbolically. For example, the symbol for an impulse train or Tate-Shafarevich group ("Ш") is actually an uppercase *sha* in the Cyrillic alphabet. (Cyrillic is supported by the OT2 font encoding, for instance). While a *sha* can be defined numerically as "`{\fontencoding{OT2}\selectfont\char88}`" it may be more intuitive to use the OT2 font encoding's "SH" ligature: "`{\fontencoding{OT2}\selectfont SH}`".

Reflecting and rotating existing symbols

A common request on `comp.text.tex` is for a reversed or rotated version of an existing symbol. As a last resort, these effects can be achieved with the graphicx (or graphics) package's `\reflectbox` and `\rotatebox` macros. For example, `\textsuperscript{\reflectbox{?}}` produces an irony mark ("⸮"; cf. `http://en.wikipedia.org/wiki/Irony_mark`), and `\rotatebox[origin=c]{180}{$\iota$}` produces the definite-description operator ("℩"). The disadvantage of the graphicx/graphics approach is that not every TeX backend handles graphical transformations.[5] Far better is to find a suitable font that contains the desired symbol in the correct orientation. For instance, if the phonetic package is available, then `\textit{\riota}` will yield a backend-independent "ɪ". Similarly, tipa's `\textrevepsilon` ("ɜ") or wsuipa's `\revepsilon` ("ɜ") may be used to express the mathematical notion of "such that" in a cleaner manner than with `\reflectbox` or `\rotatebox`.[6]

Joining and overlapping existing symbols

Symbols that do not exist in any font can sometimes be fabricated out of existing symbols. The LaTeX 2_ε source file `fontdef.dtx` contains a number of such definitions. For example, `\models` (see Table 62 on page 31) is defined in that file with:

```
\def\models{\mathrel|\joinrel=}
```

where `\mathrel` and `\joinrel` are used to control the horizontal spacing. `\def` is the TeX primitive upon which LaTeX's `\newcommand` is based. See The TeXbook [Knu86a] for more information on all three of those commands.

With some simple pattern-matching, one can easily define a backward `\models` sign ("=|"):

```
\def\ismodeledby{=\joinrel\mathrel|}
```

[4] pifont defines a convenient `\Pisymbol` command for accessing symbols in PostScript fonts by number. For example, "`\Pisymbol{psy}{191}`" produces "↵".

[5] As an example, Xdvi ignores both `\reflectbox` and `\rotatebox`.

[6] More common symbols for representing "such that" include "|", "`:`", and "`s.t.`".

In general, arrows/harpoons, horizontal lines ("=", "-", "\relbar", and "\Relbar"), and the various math-extension characters can be combined creatively with miscellaneous other characters to produce a variety of new symbols. Of course, new symbols can be composed from *any* set of existing characters. For instance, LaTeX defines \hbar ("$\hbar$") as a "$^-$" character (\mathchar'26) followed by a backspace of 9 math units (\mkern-9mu), followed by the letter "h":

```
\def\hbar{{\mathchar'26\mkern-9muh}}
```

We can just as easily define other barred letters:

```
\def\bbar{{\mathchar'26\mkern-9mu b}}
\def\dbar{{\mathchar'26\mkern-12mu d}}
```

(The space after the "mu" is optional but is added for clarity.) \bbar and \dbar define "$\bar{b}$" and "$\bar{d}$", respectively. Note that \dbar requires a greater backward math kern than \bbar; a -9 mu kern would have produced the less-attractive "$\bar{d}$" glyph.

The amsmath package provides \overset and \underset commands for placing one symbol respectively above or below another. For example, \overset{G}{\sim}[7] produces "$\overset{G}{\sim}$" (sometimes used for "equidecomposable with respect to G").

Sometimes an ordinary tabular environment can be co-opted into juxtaposing existing symbols into a new symbol. Consider the following definition of \asterism ("⁂") from a June 2007 post to comp.text.tex by Peter Flynn:

```
\newcommand{\asterism}{\smash{%
   \raisebox{-.5ex}{%
     \setlength{\tabcolsep}{-.5pt}%
     \begin{tabular}{@{}cc@{}}%
       \multicolumn2c*\\[-2ex]*&*%
     \end{tabular}}}}
```

Note how the space between columns (\tabcolsep) and rows (\\[...]) is made negative to squeeze the asterisks closer together.

There is a TeX primitive called \mathaccent that centers one mathematical symbol atop another. For example, one can define \dotcup ("$\dot\cup$")—the composition of a \cup and a \cdot—as follows:

```
\newcommand{\dotcup}{\ensuremath{\mathaccent\cdot\cup}}
```

The catch is that \mathaccent requires the accent to be a "math character". That is, it must be a character in a math font as opposed to a symbol defined in terms of other symbols. See The TeXbook [Knu86a] for more information.

Another TeX primitive that is useful for composing symbols is \vcenter. \vcenter is conceptually similar to "\begin{tabular}{l}" in LaTeX but takes a list of vertical material instead of \\-separated rows. Also, it vertically centers the result on the math axis. (Many operators, such as "+" and "−" are also vertically centered on the math axis.) Enrico Gregorio posted the following symbol definition to comp.text.tex in March 2004 in response to a query about an alternate way to denote equivalence:

```
\newcommand*{\threesim}{%
  \mathrel{\vcenter{\offinterlineskip
  \hbox{$\sim$}\vskip-.35ex\hbox{$\sim$}\vskip-.35ex\hbox{$\sim$}}}}
```

The \threesim symbol, which vertically centers three \sim ("∼") symbols with 0.35 x-heights of space between them, is rendered as "≋". \offinterlineskip is a macro that disables implicit interline spacing. Without it, \threesim would have a full line of vertical spacing between each \sim. Because of \vcenter, \threesim aligns properly with other math operators: $a \div b \threesim c \times d$.

[7] LaTeX's \stackrel command is similar but is limited to placing a symbol above a binary relation.

A related LaTeX command, borrowed from Plain TeX, is `\ooalign`. `\ooalign` vertically overlaps symbols and works both within and outside of math mode. Essentially, it creates a single-column `tabular` environment with zero vertical distance between rows. However, because it is based directly on TeX's `\ialign` primitive, `\ooalign` uses TeX's tabular syntax instead of LaTeX's (i.e., with `\cr` as the row terminator instead of `\\`). The following example of `\ooalign`, a macro that defines a standard-state symbol (`\stst`, "$^{\circ}$") as a superscripted Plimsoll line (`\barcirc`, "$\circ\!\!-$"),[8] is due to an October 2007 `comp.text.tex` post by Donald Arseneau:

```
\makeatletter
\providecommand\barcirc{\mathpalette\@barred\circ}
\def\@barred#1#2{\ooalign{\hfil$#1-$\hfil\cr\hfil$#1#2$\hfil\cr}}
\newcommand\stst{^{\protect\barcirc}}
\makeatother
```

In the preceding code, note the `\ooalign` call's use of `\hfil` to horizontally center a minus sign ("−") and a `\circ` ("∘").

As another example of `\ooalign`, consider the following code (due to Enrico Gregorio in a June 2007 post to `comp.text.tex`) that overlaps a `\ni` ("∋") and two minus signs ("−") to produce "$\backepsilon$", an obscure variation on the infrequently used "϶" symbol for "such that"discussed on page 98:

```
\newcommand{\suchthat}{%
  \mathrel{\ooalign{$\ni$\cr\kern-1pt$-$\kern-6.5pt$-$}}}
```

The slashed package, although originally designed for producing Feynman slashed-character notation, in fact facilitates the production of *arbitrary* overlapped symbols. The default behavior is to overwrite a given character with "/". For example, `\slashed{D}` produces "$\not{D}$". However, the `\declareslashed` command provides the flexibility to specify the mathematical context of the composite character (operator, relation, punctuation, etc., as will be discussed in Section 7.4), the overlapping symbol, horizontal and vertical adjustments in symbol-relative units, and the character to be overlapped. Consider, for example, the symbol for reduced quadrupole moment ("$\mathcal{I}$"). This can be declared as follows:

```
\newcommand{\rqm}{{%
  \declareslashed{}{\text{-}}{0.04}{0}{I}\slashed{I}}}
```

`\declareslashed{·}{·}{·}{·}{I}` affects the meaning of all subsequent `\slashed{I}` commands in the same scope. The preceding definition of `\rqm` therefore uses an extra set of curly braces to limit that scope to a single `\slashed{I}`. In addition, `\rqm` uses amstext's `\text` macro (described on page 102) to make `\declareslashed` use a text-mode hyphen ("-") instead of a math-mode minus sign ("−") and to ensure that the hyphen scales properly in size in subscripts and superscripts. See slashed's documentation (located in `slashed.sty` itself) for a detailed usage description of the `\slashed` and `\declareslashed` commands.

Somewhat simpler than slashed is the centernot package. centernot provides a single command, `\centernot`, which, like `\not`, puts a slash over the subsequent mathematical symbol. However, instead of putting the slash at a fixed location, `\centernot` centers the slash over its argument:

$\not\longrightarrow$ `\not\longrightarrow`

vs.

$\centernot\longrightarrow$ `\centernot\longrightarrow`

See the centernot documentation for more information.

[8] While `\barcirc` illustrates how to combine symbols using `\ooalign`, the stmaryrd package's `\minuso` command (Table 42 on page 22) provides a similar glyph ("$\circ\!\!-$") as a single, indivisible symbol.

Making new symbols work in superscripts and subscripts

To make composite symbols work properly within subscripts and superscripts, you may need to use TEX's `\mathchoice` primitive. `\mathchoice` evaluates one of four expressions, based on whether the current math style is display, text, script, or scriptscript. (See The TEXbook [Knu86a] for a more complete description.) For example, the following LATEX code—posted to `comp.text.tex` by Torsten Bronger—composes a sub/superscriptable "⊥" symbol out of `\top` and `\bot` ("⊤" and "⊥"):

```
\def\topbotatom#1{\hbox{\hbox to 0pt{$#1\bot$\hss}$#1\top$}}
\newcommand*{\topbot}{\mathrel{\mathchoice{\topbotatom\displaystyle}
                                  {\topbotatom\textstyle}
                                  {\topbotatom\scriptstyle}
                                  {\topbotatom\scriptscriptstyle}}}
```

The following is another example that uses `\mathchoice` to construct symbols in different math modes. The code defines a principal value integral symbol, which is an integral sign with a line through it.

```
\def\Xint#1{\mathchoice
   {\XXint\displaystyle\textstyle{#1}}%
   {\XXint\textstyle\scriptstyle{#1}}%
   {\XXint\scriptstyle\scriptscriptstyle{#1}}%
   {\XXint\scriptscriptstyle\scriptscriptstyle{#1}}%
   \!\int}
\def\XXint#1#2#3{{\setbox0=\hbox{$#1{#2#3}{\int}$}
     \vcenter{\hbox{$#2#3$}}\kern-.5\wd0}}
\def\ddashint{\Xint=}
\def\dashint{\Xint-}
```

(The preceding code was taken verbatim from the UK TEX Users' Group FAQ at `http://www.tex.ac.uk/faq`.) `\dashint` produces a single-dashed integral sign ("⨍"), while `\ddashint` produces a double-dashed one ("⨎"). The `\Xint` macro defined above can also be used to generate a wealth of new integrals: "∱" (`\Xint\circlearrowright`), "∲" (`\Xint\circlearrowleft`), "∯" (`\Xint\subset`), "∰" (`\Xint\infty`), and so forth.

LATEX 2ε provides a simple wrapper for `\mathchoice` that sometimes helps produce terser symbol definitions. The macro is called `\mathpalette` and it takes two arguments. `\mathpalette` invokes the first argument, passing it one of "`\displaystyle`", "`\textstyle`", "`\scriptstyle`", or "`\scriptscriptstyle`", followed by the second argument. `\mathpalette` is useful when a symbol macro must know which math style is currently in use (e.g., to set it explicitly within an `\mbox`). Donald Arseneau posted the following `\mathpalette`-based definition of a probabilistic-independence symbol ("⫫") to `comp.text.tex` in June 2000:

```
\newcommand\independent{\protect\mathpalette{\protect\independenT}{\perp}}
\def\independenT#1#2{\mathrel{\rlap{$#1#2$}\mkern2mu{#1#2}}}
```

The `\independent` macro uses `\mathpalette` to pass the `\independenT` helper macro both the current math style and the `\perp` symbol. `\independenT` typesets `\perp` in the current math style, moves two math units to the right, and finally typesets a second—overlapping—copy of `\perp`, again in the current math style. `\rlap`, which enables text overlap, is described on the following page.

Some people like their square-root signs with a trailing "hook" (i.e., "$\sqrt{\ }$") as this helps visually distinguish expressions like "$\sqrt{3x}$" from those like "$\sqrt{3}x$". In March 2002, Dan Luecking posted a `\mathpalette`-based definition of a hooked square-root symbol to `comp.text.tex`:

```
\def\hksqrt{\mathpalette\DHLhksqrt}
\def\DHLhksqrt#1#2{\setbox0=\hbox{$#1\sqrt{#2\,}$}\dimen0=\ht0
  \advance\dimen0-0.2\ht0
  \setbox2=\hbox{\vrule height\ht0 depth -\dimen0}%
  {\box0\lower0.4pt\box2}}
```

Notice how \DHLhksqrt uses \mathpalette to recover the outer math style (argument #1) from within an \hbox. The rest of the code is simply using TEX primitives to position a hook of height 0.2 times the \sqrt height at the right of the \sqrt. See The TEXbook [Knu86a] for more understanding of TEX "boxes" and "dimens".

Sometimes, however, amstext's \text macro is all that is necessary to make composite symbols appear correctly in subscripts and superscripts, as in the following definitions of \neswarrow ("↙") and \nwsearrow ("↖"):[9]

```
\newcommand{\neswarrow}{\mathrel{\text{$\nearrow$\llap{$\swarrow$}}}}
\newcommand{\nwsearrow}{\mathrel{\text{$\nwarrow$\llap{$\searrow$}}}}
```

\text resembles LATEX's \mbox command but shrinks its argument appropriately when used within a subscript or superscript. \llap ("left overlap") and its counterpart, \rlap ("right overlap"), appear frequently when creating composite characters. \llap outputs its argument to the left of the current position, overlapping whatever text is already there. Similarly, \rlap overlaps whatever text would normally appear to the right of its argument. For example, "A\llap{B}" and "\rlap{A}B" each produce "AB". However, the result of the former is the width of "A", and the result of the latter is the width of "B"—\llap{...} and \rlap{...} take up zero space.

In a June 2002 post to comp.text.tex, Donald Arseneau presented a general macro for aligning an arbitrary number of symbols on their horizontal centers and vertical baselines:

```
\makeatletter
  \def\moverlay{\mathpalette\mov@rlay}
  \def\mov@rlay#1#2{\leavevmode\vtop{%
     \baselineskip\z@skip \lineskiplimit-\maxdimen
     \ialign{\hfil$#1##$\hfil\cr#2\crcr}}}
\makeatother
```

The \makeatletter and \makeatother commands are needed to coerce LATEX into accepting "@" as part of a macro name. \moverlay takes a list of symbols separated by \cr (TEX's equivalent of LATEX's \\). For example, the \topbot command defined on the previous page could have been expressed as "\moverlay{\top\cr\bot}" and the \neswarrow command defined above could have been expressed as "\moverlay{\nearrow\cr\swarrow}".

The basic concept behind \moverlay's implementation is that \moverlay typesets the given symbols in a table that utilizes a zero \baselineskip. This causes every row to be typeset at the same vertical position. See The TEXbook [Knu86a] for explanations of the TEX primitives used by \moverlay.

Modifying LATEX-generated symbols

Oftentimes, symbols composed in the LATEX 2ε source code can be modified with minimal effort to produce useful variations. For example, fontdef.dtx composes the \ddots symbol (see Table 174 on page 65) out of three periods, raised 7 pt., 4 pt., and 1 pt., respectively:

```
\def\ddots{\mathinner{\mkern1mu\raise7\p@
    \vbox{\kern7\p@\hbox{.}}\mkern2mu
    \raise4\p@\hbox{.}\mkern2mu\raise\p@\hbox{.}\mkern1mu}}
```

\p@ is a LATEX 2ε shortcut for "pt" or "1.0pt". The remaining commands are defined in The TEXbook [Knu86a]. To draw a version of \ddots with the dots going along the opposite diagonal, we merely have to reorder the \raise7\p@, \raise4\p@, and \raise\p@:

```
\makeatletter
  \def\revddots{\mathinner{\mkern1mu\raise\p@
    \vbox{\kern7\p@\hbox{.}}\mkern2mu
    \raise4\p@\hbox{.}\mkern2mu\raise7\p@\hbox{.}\mkern1mu}}
\makeatother
```

\revddots is essentially identical to the mathdots package's \iddots command or the yhmath package's \adots command.

[9] Note that if your goal is to typeset commutative diagrams, then you should probably be using XY-pic.

Producing complex accents

Accents are a special case of combining existing symbols to make new symbols. While various tables in this document show how to add an accent to an existing symbol, some applications, such as transliterations from non-Latin alphabets, require *multiple* accents per character. For instance, the creator of pdfTEX writes his name as "Hàn Thế Thành". The dblaccnt package enables LATEX to stack accents, as in "`H\‘an Th\’{\^e} Th\‘anh`" (albeit not in the OT1 font encoding). In addition, the wsuipa package defines `\diatop` and `\diaunder` macros for putting one or more diacritics or accents above or below a given character. For example, `\diaunder[{\diatop[\’|\=]}|\textsubdot{r}]` produces "$\acute{\bar{\underset{\cdot}{\mathrm{r}}}}$". See the wsuipa documentation for more information.

The accents package facilitates the fabrication of accents in math mode. Its `\accentset` command enables *any* character to be used as an accent. For instance, `\accentset{\star}{f}` produces "$\overset{\star}{f}$" and `\accentset{e}{X}` produces "$\overset{e}{X}$". `\underaccent` does the same thing, but places the accent beneath the character. This enables constructs like `\underaccent{\tilde}{V}`, which produces "$\underset{\sim}{V}$". accents provides other accent-related features as well; see the documentation for more information.

Creating extensible symbols

A relatively simple example of creating extensible symbols stems from a `comp.text.tex` post by Donald Arseneau (June 2003). The following code defines an equals sign that extends as far to the right as possible, just like LATEX's `\hrulefill` command:

```
\makeatletter
\def\equalsfill{$\m@th\mathord=\mkern-7mu
  \cleaders\hbox{$\!\mathord=\!$}\hfill
  \mkern-7mu\mathord=$}
\makeatother
```

TEX's `\cleaders` and `\hfill` primitives are the key to understanding `\equalsfill`'s extensibility. Essentially, `\equalsfill` repeats a box containing "=" plus some negative space until it fills the maximum available horizontal space. `\equalsfill` is intended to be used with LATEX's `\stackrel` command, which stacks one mathematical expression (slightly reduced in size) atop another. Hence, "`\stackrel{a}{\rightarrow}`" produces "$\stackrel{a}{\rightarrow}$" and "X `\stackrel{\text{definition}}{\hbox{\equalsfill}}` Y" produces "$X \stackrel{\text{definition}}{=\!=\!=\!=\!=\!=\!=} Y$".

If all that needs to extend are horizontal and vertical lines—as opposed to repeated symbols such as the "=" in the previous example—LATEX's `array` or `tabular` environments may suffice. Consider the following code (due to a February 1999 `comp.text.tex` post by Donald Arseneau) for typesetting annuities:

```
\DeclareRobustCommand{\annu}[1]{_{%
 \def\arraystretch{0}%
 \setlength\arraycolsep{1pt}%        adjust these
 \setlength\arrayrulewidth{.2pt}%  two settings
 \begin{array}[b]{@{}c|}\hline
 \\[\arraycolsep]%
 \scriptstyle #1%
 \end{array}%
}}
```

One can then use, e.g., "`$A\annu{x:n}$`" to produce "$A_{\overline{x:n}|}$".

A more complex example of composing accents is the following definition of extensible `\overbracket`, `\underbracket`, `\overparenthesis`, and `\underparenthesis` symbols, taken from a May 2002 `comp.text.tex` post by Donald Arseneau:

```
\makeatletter
\def\overbracket#1{\mathop{\vbox{\ialign{##\crcr\noalign{\kern3\p@}
      \downbracketfill\crcr\noalign{\kern3\p@\nointerlineskip}
      $\hfil\displaystyle{#1}\hfil$\crcr}}}\limits}
```

```
\def\underbracket#1{\mathop{\vtop{\ialign{##\crcr
      $\hfil\displaystyle{#1}\hfil$\crcr\noalign{\kern3\p@\nointerlineskip}
      \upbracketfill\crcr\noalign{\kern3\p@}}}}\limits}
\def\overparenthesis#1{\mathop{\vbox{\ialign{##\crcr\noalign{\kern3\p@}
      \downparenthfill\crcr\noalign{\kern3\p@\nointerlineskip}
      $\hfil\displaystyle{#1}\hfil$\crcr}}}\limits}
\def\underparenthesis#1{\mathop{\vtop{\ialign{##\crcr
      $\hfil\displaystyle{#1}\hfil$\crcr\noalign{\kern3\p@\nointerlineskip}
      \upparenthfill\crcr\noalign{\kern3\p@}}}}\limits}
\def\downparenthfill{$\m@th\braceld\leaders\vrule\hfill\bracerd$}
\def\upparenthfill{$\m@th\bracelu\leaders\vrule\hfill\braceru$}
\def\upbracketfill{$\m@th\makesm@sh{\llap{\vrule\@height3\p@\@width.7\p@}}%
  \leaders\vrule\@height.7\p@\hfill
  \makesm@sh{\rlap{\vrule\@height3\p@\@width.7\p@}}$}
\def\downbracketfill{$\m@th
  \makesm@sh{\llap{\vrule\@height.7\p@\@depth2.3\p@\@width.7\p@}}%
  \leaders\vrule\@height.7\p@\hfill
  \makesm@sh{\rlap{\vrule\@height.7\p@\@depth2.3\p@\@width.7\p@}}$}
\makeatother
```

Table 283 showcases these accents. The TEXbook [Knu86a] or another book on TEX primitives is indispensible for understanding how the preceding code works. The basic idea is that `\downparenthfill`, `\upparenthfill`, `\downbracketfill`, and `\upbracketfill` do all of the work; they output a left symbol (e.g., `\braceld` [“⎛”] for `\downparenthfill`), a horizontal rule that stretches as wide as possible, and a right symbol (e.g., `\bracerd` [“⎞”] for `\downparenthfill`). `\overbracket`, `\underbracket`, `\overparenthesis`, and `\underparenthesis` merely create a table whose width is determined by the given text, thereby constraining the width of the horizontal rules.

TABLE 283: Manually Composed Extensible Accents

$\overbracket{abc}$	`\overbracket{abc}`	$\overparenthesis{abc}$	`\overparenthesis{abc}`
$\underbracket{abc}$	`\underbracket{abc}`	$\underparenthesis{abc}$	`\underparenthesis{abc}`

Note that the simplewick package provides mechanisms for typesetting Wick contractions, which utilize `\overbracket`- and `\underbracket`-like brackets of variable width *and* height (or depth). For example, “`\acontraction{}{A}{B}{C}\acontraction[2ex]{A}{B}{C}{D}\bcontraction{}{A}{BC}{D}ABCD`” produces

$$\overbracket{A\overbracket{B\underbracket{C}D}}\underbracket{ABCD} \quad .$$

See the simplewick documentation for more information.

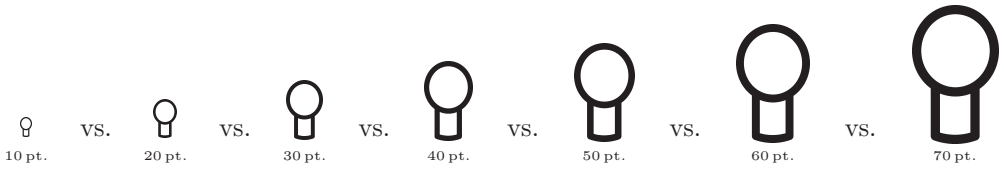
Developing new symbols from scratch

Sometimes is it simply not possible to define a new symbol in terms of existing symbols. Fortunately, most, if not all, TEX distributions are shipped with a tool called METAFONT which is designed specifically for creating fonts to be used with TEX. The METAFONTbook [Knu86b] is the authoritative text on METAFONT. If you plan to design your own symbols with METAFONT, The METAFONTbook is essential reading. Nevertheless, the following is an extremely brief tutorial on how to create a new LATEX symbol using METAFONT. Its primary purpose is to cover the LATEX-specific operations not mentioned in The METAFONTbook and to demonstrate that symbol-font creation is not necessarily a difficult task.

Suppose we need a symbol to represent a light bulb (“💡”).[10] The first step is to draw this in METAFONT. It is common to separate the font into two files: a size-dependent file, which specifies the design size and various font-specific parameters that are a function of the design size; and a size-independent file, which draws

[10] I’m not a very good artist; you’ll have to pretend that “💡” looks like a light bulb.

characters in the given size. Figure 2 shows the METAFONT code for `lightbulb10.mf`. `lightbulb10.mf` specifies various parameters that produce a 10 pt. light bulb then loads `lightbulb.mf`. Ideally, one should produce `lightbulb`⟨*size*⟩`.mf` files for a variety of ⟨*size*⟩s. This is called "optical scaling". It enables, for example, the lines that make up the light bulb to retain the same thickness at different font sizes, which looks much nicer than the alternative—and default—"mechanical scaling". When a `lightbulb`⟨*size*⟩`.mf` file does not exist for a given size ⟨*size*⟩, the computer mechanically produces a wider, taller, thicker symbol:




```
font_identifier := "LightBulb10";                    % Name the font.
font_size 10pt#;                                     % Specify the design size.

em# := 10pt#;                                        % "M" width is 10 points.
cap# := 7pt#;                                        % Capital letter height is 7 points above the baseline.
sb# := 1/4pt#;                                       % Leave this much space on the side of each character.
o# := 1/16pt#;                                       % Amount that curves overshoot borders.

input lightbulb                                      % Load the file that draws the actual glyph.
```

Figure 2: Sample METAFONT size-specific file (`lightbulb10.mf`)

`lightbulb.mf`, shown in Figure 3, draws a light bulb using the parameters defined in `lightbulb10.mf`. Note that the the filenames "`lightbulb10.mf`" and "`lightbulb.mf`" do not follow the Berry font-naming scheme [Ber01]; the Berry font-naming scheme is largely irrelevant for symbol fonts, which generally lack bold, italic, small-caps, slanted, and other such variants.

The code in Figures 2 and 3 is heavily commented and should demonstrate some of the basic concepts behind METAFONT usage: declaring variables, defining points, drawing lines and curves, and preparing to debug or fine-tune the output. Again, The METAFONTbook [Knu86b] is the definitive reference on METAFONT programming.

METAFONT can produce "proofs" of fonts—large, labeled versions that showcase the logical structure of each character. In fact, proof mode is METAFONT's default mode. To produce a proof of `lightbulb10.mf`, issue the following commands at the operating-system prompt:

```
prompt> mf lightbulb10.mf                ⇐ Produces lightbulb10.2602gf
prompt> gftodvi lightbulb10.2602gf       ⇐ Produces lightbulb10.dvi
```

You can then view `lightbulb10.dvi` with any DVI viewer. The result is shown in Figure 4. Observe how the grid defined with *makegrid* at the bottom of Figure 3 draws vertical lines at positions 0, *sb*, $w/2$, and $w - sb$ and horizontal lines at positions 0, $-1pt$, y_2, and h. Similarly, observe how the *penlabels* command labels all of the important coordinates: $z_1, z_2, \ldots, z_8$ and z_{67}, which `lightbulb.mf` defines to lie between z_6 and z_7.

Most, if not all, TEX distributions include a Plain TEX file called `testfont.tex` which is useful for testing new fonts in a variety of ways. One useful routine produces a table of all of the characters in the font:

```
prompt> tex testfont
This is TeX, Version 3.14159 (Web2C 7.3.1)
(/usr/share/texmf/tex/plain/base/testfont.tex
Name of the font to test = lightbulb10
Now type a test command (\help for help):)
*\table

*\bye
```

```
mode_setup;                                          % Target a given printer.

define_pixels(em, cap, sb);                          % Convert to device-specific units.
define_corrected_pixels(o);                          % Same, but add a device-specific fudge factor.

%% Define a light bulb at the character position for "A"
%% with width 1/2em#, height cap#, and depth 1pt#.
beginchar("A", 1/2em#, cap#, 1pt#); "A light bulb";
    pickup pencircle scaled 1/2pt;                   % Use a pen with a small, circular tip.

    %% Define the points we need.
    top z1 = (w/2, h + o);                           % z1 is at the top of a circle.
    rt z2 = (w + sb + o - x4, y4);                   % z2 is at the same height as z4 but the opposite side.
    bot z3 = (z1 - (0, w - sb - o));                 % z3 is at the bottom of the circle.
    lft z4 = (sb - o, 1/2[y1, y3]);                  % z4 is on the left of the circle.
    path bulb;                                       % Define a path for the bulb itself.
    bulb = z1 .. z2 .. z3 .. z4 .. cycle;            % The bulb is a closed path.

    z5 = point 2 - 1/3 of bulb;                      % z5 lies on the bulb, a little to the right of z3.
    z6 = (x5, 0);                                    % z6 is at the bottom, directly under z5.
    z7 = (x8, 0);                                    % z7 is at the bottom, directly under z8.
    z8 = point 2 + 1/3 of bulb;                      % z8 lies on the bulb, a little to the left of z3.
    bot z67 = (1/2[x6, x7], pen_bot - o - 1/8pt);    % z67 lies halfway between z6 and z7 but a jot lower.

    %% Draw the bulb and the base.
    draw bulb;                                       % Draw the bulb proper.
    draw z5 -- z6 .. z67 .. z7 -- z8;                % Draw the base of the bulb.

    %% Display key positions and points to help us debug.
    makegrid(0, sb, w/2, w - sb)(0, -1pt, y2, h);    % Label "interesting" x and y coordinates.
    penlabels(1, 2, 3, 4, 5, 6, 67, 7, 8);           % Label control points for debugging.
endchar;
end
```

Figure 3: Sample METAFONT size-independent file (`lightbulb.mf`)

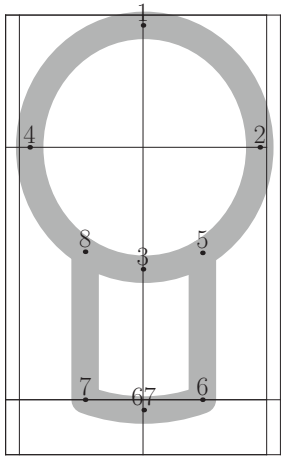


Figure 4: Proof diagram of `lightbulb10.mf`

```
[1]
Output written on testfont.dvi (1 page, 1516 bytes).
Transcript written on testfont.log.
```

The resulting table, stored in `testfont.dvi` and illustrated in Figure 5, shows every character in the font. To understand how to read the table, note that the character code for "A"—the only character defined by `lightbulb10.mf`—is 41 in hexadecimal (base 16) and 101 in octal (base 8).

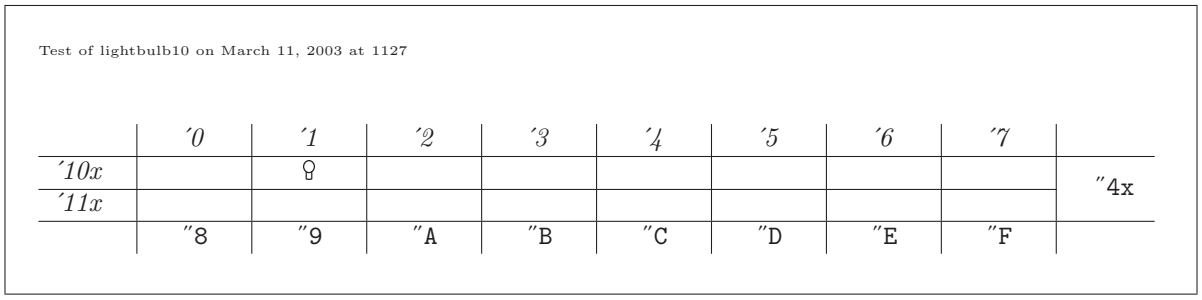


Figure 5: Font table produced by `testfont.tex`

The LightBulb10 font is now usable by TEX. LATEX 2ε, however, needs more information before documents can use the font. First, we create a font-description file that tells LATEX 2ε how to map fonts in a given font family and encoding to a particular font in a particular font size. For symbol fonts, this mapping is fairly simple. Symbol fonts almost always use the "U" ("Unknown") font encoding and frequently occur in only one variant: normal weight and non-italicized. The filename for a font-description file important; it must be of the form "⟨*encoding*⟩⟨*family*⟩`.fd`", where ⟨*encoding*⟩ is the lowercase version of the encoding name (typically "u" for symbol fonts) and ⟨*family*⟩ is the name of the font family. For LightBulb10, let's call this "bulb". Figure 6 lists the contents of `ubulb.fd`. The document "LATEX 2ε Font Selection" [LAT00] describes `\DeclareFontFamily` and `\DeclareFontShape` in detail, but the gist of `ubulb.fd` is first to declare a `U`-encoded version of the `bulb` font family and then to specify that a LATEX 2ε request for a `U`-encoded version of `bulb` with a (`m`)edium font series (as opposed to, e.g., bold) and a (`n`)ormal font shape (as opposed to, e.g., italic) should translate into a TEX request for `lightbulb10.tfm` mechanically scaled to the current font size.

```
\DeclareFontFamily{U}{bulb}{}
\DeclareFontShape{U}{bulb}{m}{n}{<-> lightbulb10}{}
```

Figure 6: LATEX 2ε font-description file (`ubulb.fd`)

The final step is to write a LATEX 2ε style file that defines a name for each symbol in the font. Because we have only one symbol our style file, `lightbulb.sty` (Figure 7), is rather trivial. Note that instead of typesetting "`A`" we could have had `\lightbulb` typeset "`\char65`", "`\char"41`", or "`\char'101`" (respectively, decimal, hexadecimal, and octal character offsets into the font). For a simple, one-character symbol font such as LightBulb10 it would be reasonable to merge `ubulb.fd` into `lightbulb.sty` instead of maintaining two separate files. In either case, a document need only include "`\usepackage{lightbulb}`" to make the `\lightbulb` symbol available.

```
\newcommand{\lightbulb}{{\usefont{U}{bulb}{m}{n}A}}
```

Figure 7: LATEX 2ε style file (`lightbulb.sty`)

METAFONT normally produces bitmapped fonts. However, it is also possible, with the help of some external tools, to produce PostScript Type 1 fonts. These have the advantages of rendering better in Adobe® Acrobat® (at least in versions prior to 6.0) and of being more memory-efficient when handled by a PostScript interpreter. See `http://www.tex.ac.uk/cgi-bin/texfaq2html?label=textrace` for pointers to tools that can produce Type 1 fonts from METAFONT.

7.4 Math-mode spacing

Terms such as "binary operators", "relations", and "punctuation" in Section 3 primarily regard the surrounding spacing. (See the Short Math Guide for LaTeX [Dow00] for a nice exposition on the subject.) To use a symbol for a different purpose, you can use the TeX commands `\mathord`, `\mathop`, `\mathbin`, `\mathrel`, `\mathopen`, `\mathclose`, and `\mathpunct`. For example, if you want to use `\downarrow` as a variable (an "ordinary" symbol) instead of a delimiter, you can write "`$3 x + \mathord{\downarrow}$`" to get the properly spaced "$3x+\downarrow$" rather than the awkward-looking "$3x+ \downarrow$". Similarly, to create a dotted-union symbol ("$\dot\cup$") that spaces like the ordinary set-union symbol (`\cup`) it must be defined with `\mathbin`, just as `\cup` is. Contrast "`$A \dot{\cup} B$`" ("$A\dot\cup B$") with "`$A \mathbin{\dot{\cup}} B$`" ("$A \dot\cup B$"). See The TeXbook [Knu86a] for the definitive description of math-mode spacing.

The purpose of the "log-like symbols" in Tables 120 and 121 is to provide the correct amount of spacing around and within multiletter function names. Table 284 contrasts the output of the log-like symbols with various, naïve alternatives. In addition to spacing, the log-like symbols also handle subscripts properly. For example, "`\max_{p \in P}`" produces "$\max_{p\in P}$" in text, but "$\max\limits_{p\in P}$" as part of a displayed formula.

Table 284: Spacing Around/Within Log-like Symbols

LaTeX expression	Output	
`$r \sin \theta$`	$r \sin \theta$	(best)
`$r sin \theta$`	$rsin\theta$	
`$r \mbox{sin} \theta$`	$r\mathrm{sin}\theta$	
`$r \mathrm{sin} \theta$`	$r\mathrm{sin}\theta$	

The amsmath package makes it straightforward to define new log-like symbols:

```
\DeclareMathOperator{\atan}{atan}
\DeclareMathOperator*{\lcm}{lcm}
```

The difference between `\DeclareMathOperator` and `\DeclareMathOperator*` involves the handling of subscripts. With `\DeclareMathOperator*`, subscripts are written beneath log-like symbols in display style and to the right in text style. This is useful for limit operators (e.g., `\lim`) and functions that tend to map over a set (e.g., `\min`). In contrast, `\DeclareMathOperator` tells TeX that subscripts should always be displayed to the right of the operator, as is common for functions that take a single parameter (e.g., `\log` and `\cos`). Table 285 contrasts symbols declared with `\DeclareMathOperator` and `\DeclareMathOperator*` in both text style (`$...$`) and display style (`\[...\]`).[11]

Table 285: Defining new log-like symbols

Declaration function	`$\newlogsym_{p \in P}$`	`\[ \newlogsym_{p \in P} \]`
`\DeclareMathOperator`	$\mathrm{newlogsym}_{p\in P}$	$\mathrm{newlogsym}_{p\in P}$
`\DeclareMathOperator*`	$\mathrm{newlogsym}_{p\in P}$	$\mathrm{newlogsym}\limits_{p\in P}$

It is common to use a thin space (`\,`) between the words of a multiword operators, as in "`\DeclareMathOperator*{\argmax}{arg\,max}`". `\liminf`, `\limsup`, and all of the log-like symbols shown in Table 121 utilize this spacing convention.

7.5 Bold mathematical symbols

LaTeX does not normally use bold symbols when typesetting mathematics. However, bold symbols are occasionally needed, for example when naming vectors. Any of the approaches described at `http://www.tex.ac.uk/cgi-bin/`

[11] Note that `\displaystyle` can be used to force display style within `$...$` and `\textstyle` can be used to force text style within `\[...\]`.

texfaq2html?label=boldgreek can be used to produce bold mathematical symbols. Table 286 contrasts the output produced by these various techniques. As the table illustrates, these techniques exhibit variation in their formatting of Latin letters (upright vs. italic), formatting of Greek letters (bold vs. normal), formatting of operators and relations (bold vs. normal), and spacing.

Table 286: Producing bold mathematical symbols

Package	Code	Output	
none	`$\alpha + b = \Gamma \div D$`	$\alpha + b = \Gamma \div D$	(no bold)
none	`$\mathbf{\alpha + b = \Gamma \div D}$`	$\alpha + \mathbf{b} = \mathbf{\Gamma \div D}$	
none	`\boldmath$\alpha + b = \Gamma \div D$`	$\boldsymbol{\alpha + b = \Gamma \div D}$	
amsbsy	`$\pmb{\alpha + b = \Gamma \div D}$`	$\boldsymbol{\alpha + b = \Gamma \div D}$	(faked bold)
amsbsy	`$\boldsymbol{\alpha + b = \Gamma \div D}$`	$\boldsymbol{\alpha + b = \Gamma \div D}$	
bm	`$\bm{\alpha + b = \Gamma \div D}$`	$\boldsymbol{\alpha + b = \Gamma \div D}$	
fixmath	`$\mathbold{\alpha + b = \Gamma \div D}$`	$\boldsymbol{\alpha + b = \Gamma \div D}$	

7.6 ASCII and Latin 1 quick reference

Table 287 on the next page amalgamates data from various other tables in this document into a convenient reference for LaTeX 2ε typesetting of ASCII characters, i.e., the characters available on a typical U.S. computer keyboard. The first two columns list the character's ASCII code in decimal and hexadecimal. The third column shows what the character looks like. The fourth column lists the LaTeX 2ε command to typeset the character as a text character. And the fourth column lists the LaTeX 2ε command to typeset the character within a `\texttt{...}` command (or, more generally, when `\ttfamily` is in effect).

The following are some additional notes about the contents of Table 287:

- "`"` is not available in the OT1 font encoding.
- The characters "`<`", "`>`", and "`|`" do work as expected in math mode, although they produce, respectively, "¡", "¿", and "—" in text mode when using the OT1 font encoding.[12] The following are some alternatives for typesetting "<", ">", and "|":
  - Specify a document font encoding other than OT1 (as described on page 8).
  - Use the appropriate symbol commands from Table 2 on page 9, viz. `\textless`, `\textgreater`, and `\textbar`.
  - Enter the symbols in math mode instead of text mode, i.e., `$<$`, `$>$`, and `$|$`.

  Note that for typesetting metavariables many people prefer `\textlangle` and `\textrangle` to `\textless` and `\textgreater`, i.e., "⟨*filename*⟩" instead of "<*filename*>".
- Although "`/`" does not require any special treatment, LaTeX additionally defines a `\slash` command which outputs the same glyph but permits a line break afterwards. That is, "`increase/decrease`" is always typeset as a single entity while "`increase\slash{}decrease`" may be typeset with "increase/" on one line and "decrease" on the next.
- `\textasciicircum` can be used instead of `\^{}`, and `\textasciitilde` can be used instead of `\~{}`. Note that `\textasciitilde` and `\~{}` produce raised, diacritic tildes. "Text" (i.e., vertically centered) tildes can be generated with either the math-mode `\sim` command (shown in Table 62 on page 31), which produces a somewhat wide "∼", or the textcomp package's `\texttildelow` (shown in Table 36 on page 20), which produces a vertically centered "~" in most fonts but a baseline-oriented "˜" in Computer Modern, txfonts, pxfonts, and various other fonts originating from the TeX world. If your goal is to typeset tildes in URLs or

[12] Donald Knuth didn't think such symbols were important outside of mathematics so he omitted them from his text fonts.

TABLE 287: LaTeX 2ε ASCII Table

Dec	Hex	Char	Body text	\texttt
33	21	!	!	!
34	22	"	\textquotedbl	"
35	23	#	\#	\#
36	24	$	\$	\$
37	25	%	\%	\%
38	26	&	\&	\&
39	27	’	’	’
40	28	(	(	(
41	29	)	)	)
42	2A	*	*	*
43	2B	+	+	+
44	2C	,	,	,
45	2D	-	-	-
46	2E	.	.	.
47	2F	/	/	/
48	30	0	0	0
49	31	1	1	1
50	32	2	2	2
⋮	⋮	⋮	⋮	⋮
57	39	9	9	9
58	3A	:	:	:
59	3B	;	;	;
60	3C	<	\textless	<
61	3D	=	=	=
62	3E	>	\textgreater	>
63	3F	?	?	?
64	40	@	@	@
65	41	A	A	A
66	42	B	B	B
67	43	C	C	C
⋮	⋮	⋮	⋮	⋮
90	5A	Z	Z	Z
91	5B	[	[	[
92	5C	\	\textbackslash	\char‘\\
93	5D	]	]	]
94	5E	^	\^{}	\^{}
95	5F	_	_	\char‘_
96	60	‘	‘	‘
97	61	a	a	a
98	62	b	b	b
99	63	c	c	c
⋮	⋮	⋮	⋮	⋮
122	7A	z	z	z
123	7B	{	\{	\char‘\{
124	7C	|	\textbar	|
125	7D	}	\}	\char‘\}
126	7E	~	\~{}	\~{}

Unix filenames, your best bet is to use the url package, which has a number of nice features such as proper line-breaking of such names.

- The various `\char` commands within `\texttt` are necessary only in the OT1 font encoding. In other encodings (e.g., T1), commands such as `\{`, `\}`, `\_`, and `\textbackslash` all work properly.
- The code page 437 (IBM PC) version of ASCII characters 1 to 31 can be typeset using the ascii package. See Table 209 on page 74.
- To replace “‘” and “’” with the more computer-like (and more visibly distinct) “`” and “'” within a `verbatim` environment, use the upquote package. Outside of `verbatim`, you can use `\char18` and `\char13` to get the modified quote characters. (The former is actually a grave accent.)

Similar to Table 287, Table 288 on the next page is an amalgamation of data from other tables in this document. While Table 287 shows how to typeset the 7-bit ASCII character set, Table 288 shows the Latin 1 (Western European) character set, also known as ISO-8859-1.

The following are some additional notes about the contents of Table 288:

- A “(tc)” after a symbol name means that the textcomp package must be loaded to access that symbol. A “(T1)” means that the symbol requires the T1 font encoding. The fontenc package can change the font encoding document-wide.
- Many of the `\text...` accents can also be produced using the accent commands shown in Table 18 on page 14 plus an empty argument. For instance, `\={}` is essentially the same as `\textasciimacron`.

TABLE 288: LaTeX 2_ε Latin 1 Table

Dec	Hex	Char	LaTeX 2_ε	
161	A1	¡	!‘	
162	A2	¢	\textcent	(tc)
163	A3	£	\pounds	
164	A4	¤	\textcurrency	(tc)
165	A5	¥	\textyen	(tc)
166	A6	¦	\textbrokenbar	(tc)
167	A7	§	\S	
168	A8	¨	\textasciidieresis	(tc)
169	A9	©	\textcopyright	
170	AA	ª	\textordfeminine	
171	AB	«	\guillemotleft	(T1)
172	AC	¬	\textlnot	(tc)
173	AD	-	\-	
174	AE	®	\textregistered	
175	AF	¯	\textasciimacron	(tc)
176	B0	°	\textdegree	(tc)
177	B1	±	\textpm	(tc)
178	B2	²	\texttwosuperior	(tc)
179	B3	³	\textthreesuperior	(tc)
180	B4	´	\textasciiacute	(tc)
181	B5	µ	\textmu	(tc)
182	B6	¶	\P	
183	B7	·	\textperiodcentered	
184	B8	¸	\c{}	
185	B9	¹	\textonesuperior	(tc)
186	BA	º	\textordmasculine	
187	BB	»	\guillemotright	(T1)
188	BC	¼	\textonequarter	(tc)
189	BD	½	\textonehalf	(tc)
190	BE	¾	\textthreequarters	(tc)
191	BF	¿	?‘	
192	C0	À	\‘{A}	
193	C1	Á	\’{A}	
194	C2	Â	\^{A}	
195	C3	Ã	\~{A}	
196	C4	Ä	\"{A}	
197	C5	Å	\AA	
198	C6	Æ	\AE	
199	C7	Ç	\c{C}	
200	C8	È	\‘{E}	
201	C9	É	\’{E}	
202	CA	Ê	\^{E}	
203	CB	Ë	\"{E}	
204	CC	Ì	\‘{I}	
205	CD	Í	\’{I}	
206	CE	Î	\^{I}	
207	CF	Ï	\"{I}	
208	D0	Đ	\DH	(T1)

Dec	Hex	Char	LaTeX 2_ε	
209	D1	Ñ	\~{N}	
210	D2	Ò	\‘{O}	
211	D3	Ó	\’{O}	
212	D4	Ô	\^{O}	
213	D5	Õ	\~{O}	
214	D6	Ö	\"{O}	
215	D7	×	\texttimes	(tc)
216	D8	Ø	\O	
217	D9	Ù	\‘{U}	
218	DA	Ú	\’{U}	
219	DB	Û	\^{U}	
220	DC	Ü	\"{U}	
221	DD	Ý	\’{Y}	
222	DE	Þ	\TH	(T1)
223	DF	ß	\ss	
224	E0	à	\‘{a}	
225	E1	á	\’{a}	
226	E2	â	\^{a}	
227	E3	ã	\~{a}	
228	E4	ä	\"{a}	
229	E5	å	\aa	
230	E6	æ	\ae	
231	E7	ç	\c{c}	
232	E8	è	\‘{e}	
233	E9	é	\’{e}	
234	EA	ê	\^{e}	
235	EB	ë	\"{e}	
236	EC	ì	\‘{ı}	
237	ED	í	\’{ı}	
238	EE	î	\^{ı}	
239	EF	ï	\"{ı}	
240	F0	ð	\dh	(T1)
241	F1	ñ	\~{n}	
242	F2	ò	\‘{o}	
243	F3	ó	\’{o}	
244	F4	ô	\^{o}	
245	F5	õ	\~{o}	
246	F6	ö	\"{o}	
247	F7	÷	\textdiv	(tc)
248	F8	ø	\o	
249	F9	ù	\‘{u}	
250	FA	ú	\’{u}	
251	FB	û	\^{u}	
252	FC	ü	\"{u}	
253	FD	ý	\’{y}	
254	FE	þ	\th	(T1)
255	FF	ÿ	\"{y}	

- The commands in the "LaTeX 2ε" columns work both in body text and within a `\texttt{...}` command (or, more generally, when `\ttfamily` is in effect).
- The "£" and "$" glyphs occupy the same slot (36) of the OT1 font encoding, with "£" appearing in italic fonts and "$" appearing in roman fonts. A problem with LaTeX's default handling of this double-mapping is that "`{\sffamily\slshape\pounds}`" produces "*$*", not "*£*". Other font encodings use separate slots for the two characters and are therefore robust to the problem of "£"/"$" conflicts. Authors who use `\pounds` should select a font encoding other than OT1 (as explained on page 8) or use the textcomp package, which redefines `\pounds` to use the TS1 font encoding.
- Character 173, `\-`, is shown as "-" but is actually a discretionary hyphen; it appears only at the end of a line.

Microsoft® Windows® normally uses a superset of Latin 1 called "Code Page 1252" or "CP1252" for short. CP1252 introduces symbols in the Latin 1 "invalid" range (characters 128–159). Table 289 presents the characters with which CP1252 augments the standard Latin 1 table.

Table 289: LaTeX 2ε Code Page 1252 Table

Dec	Hex	Char	LaTeX 2ε	
128	80	€	`\texteuro`	(tc)
130	82	‚	`\quotesinglbase`	(T1)
131	83	*f*	`\textit{f}`	
132	84	„	`\quotedblbase`	(T1)
133	85	…	`\dots`	
134	86	†	`\dag`	
135	87	‡	`\ddag`	
136	88	ˆ	`\textasciicircum`	
137	89	‰	`\textperthousand`	(tc)
138	8A	Š	`\v{S}`	
139	8B	‹	`\guilsinglleft`	(T1)
140	8C	Œ	`\OE`	
142	8E	Ž	`\v{Z}`	

Dec	Hex	Char	LaTeX 2ε	
145	91	‘	` ` `	
146	92	’	`'`	
147	93	“	` `` `	
148	94	”	`''`	
149	95	•	`\textbullet`	
150	96	–	`--`	
151	97	—	`---`	
152	98	˜	`\textasciitilde`	
153	99	™	`\texttrademark`	
154	9A	š	`\v{s}`	
155	9B	›	`\guilsinglright`	(T1)
156	9C	œ	`\oe`	
158	9E	ž	`\v{z}`	
159	9F	Ÿ	`\"{Y}`	

The following are some additional notes about the contents of Table 289:

- As in Table 288, a "(tc)" after a symbol name means that the textcomp package must be loaded to access that symbol. A "(T1)" means that the symbol requires the T1 font encoding. The fontenc package can change the font encoding document-wide.
- Not all characters in the 128–159 range are defined.
- Look up "euro signs" in the index for alternatives to `\texteuro`.

While too large to incorporate into this document, a listing of ISO 8879:1986 SGML/XML character entities and their LaTeX equivalents is available from `http://www.bitjungle.com/~isoent/`. Some of the characters presented there make use of isoent, a LaTeX 2ε package (available from the same URL) that fakes some of the missing ISO glyphs using the LaTeX `picture` environment.[13]

[13] isoent is not featured in this document, because it is not available from CTAN and because the faked symbols are not "true" characters; they exist in only one size, regardless of the body text's font size.

7.7 About this document

History David Carlisle wrote the first version of this document in October, 1994. It originally contained all of the native LaTeX symbols (Tables 40, 52, 62, 95, 120, 122, 141, 142, 152, 157, 184, and a few tables that have since been reorganized) and was designed to be nearly identical to the tables in Chapter 3 of Leslie Lamport's book [Lam86]. Even the table captions and the order of the symbols within each table matched! The $\mathcal{AMS}$ symbols (Tables 41, 63, 64, 98, 99, 123, 127, 137, and 185) and an initial Math Alphabets table (Table 196) were added thereafter. Later, Alexander Holt provided the stmaryrd tables (Tables 42, 54, 65, 101, 117, and 138).

In January, 2001, Scott Pakin took responsibility for maintaining the symbol list and has since implemented a complete overhaul of the document. The result, now called, "The Comprehensive LaTeX Symbol List", includes the following new features:

- the addition of a handful of new math alphabets, dozens of new font tables, and thousands of new symbols
- the categorization of the symbol tables into body-text symbols, mathematical symbols, science and technology symbols, dingbats, and other symbols, to provide a more user-friendly document structure
- an index, table of contents, and a frequently-requested symbol list, to help users quickly locate symbols
- symbol tables rewritten to list the symbols in alphabetical order
- appendices to provide additional information relevant to using symbols in LaTeX
- tables showing how to typeset all of the characters in the ASCII and Latin 1 font encodings

Furthermore, the internal structure of the document has been completely altered from David's original version. Most of the changes are geared towards making the document easier to extend, modify, and reformat.

Build characteristics Table 290 lists some of this document's build characteristics. Most important is the list of packages that LaTeX couldn't find, but that `symbols.tex` otherwise would have been able to take advantage of. Complete, prebuilt versions of this document are available from CTAN (`http://www.ctan.org/` or one of its many mirror sites) in the directory `tex-archive/info/symbols/comprehensive`. Table 291 shows the package date (specified in the `.sty` file with `\ProvidesPackage`) for each package that was used to build this document and that specifies a package date. Packages are not listed in any particular order in either Table 290 or 291.

Table 290: Document Characteristics

Characteristic	Value
Source file:	`symbols.tex`
Build date:	January 3, 2008
Symbols documented:	4947
Packages included:	textcomp latexsym amssymb stmaryrd euscript wasysym pifont manfnt bbding undertilde ifsym tipa tipx extraipa wsuipa phonetic ulsy ar metre txfonts mathabx fclfont skak ascii dingbat skull eurosym esvect yfonts yhmath esint mathdots trsym universa upgreek overrightarrow chemarr chemarrow nath trfsigns mathtools phaistos arcs vietnam t4phonet holtpolt semtrans dictsym extarrows protosem harmony hieroglf cclicenses mathdesign arev MnSymbol cmll extpfeil keystroke fge turnstile simpsons epsdice feyn universal staves igo accents nicefrac bm mathrsfs chancery calligra bbold mbboard dsfont bbm
Packages omitted:	*none*

TABLE 291: Package versions used in the preparation of this document

Name	Date
textcomp	2005/09/27
latexsym	1998/08/17
amssymb	2002/01/22
stmaryrd	1994/03/03
euscript	2001/10/01
wasysym	2003/10/30
pifont	2005/04/12
manfnt	1999/07/01
bbding	1996/06/21
undertilde	2000/08/08
ifsym	2000/04/18
tipa	2002/08/08
tipx	2003/01/01
wsuipa	1994/07/16
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mathabx	2003/07/29
skak	2003/09/27
ascii	2006/05/30
dingbat	2001/04/27
skull	2002/01/23
eurosym	1998/08/06
yfonts	2003/01/08
mathdots	2006/03/16
trsym	2000/06/25
universa	98/08/01
upgreek	2003/02/12
chemarr	2006/02/20
mathtools	2004/10/10
phaistos	2004/04/23
arcs	2004/05/09
t4phonet	2004/06/01
semtrans	1998/02/10
dictsym	2004/07/26
extarrows	2002/03/30
protosem	2005/03/18
harmony	2007/05/03
hieroglf	2000/09/23
cclicenses	2005/05/20
arev	2005/06/14
MnSymbol	2007/01/21
extpfeil	2006/07/27
keystroke	2003/08/15
fge	2007/06/03
turnstile	2007/06/23
epsdice	2001/02/15
feyn	2002/04/23
universal	97/12/24
accents	2006/05/12
nicefrac	1998/08/04
bm	2004/02/26
calligra	1996/07/18

7.8 Copyright and license

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[LaT00] LaTeX3 Project Team. LaTeX 2_ε font selection, January 30, 2000. Available from http://www.ctan.org/tex-archive/macros/latex/doc/fntguide.ps (also included in many TeX distributions).

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If you're having trouble locating a symbol, try looking under "T" for "`\text`...". Many text-mode commands begin with that prefix. Also, accents are shown over/under a gray box, e.g., "◌́" for "`\'`".

Some symbol entries appear to be listed repeatedly. This happens when multiple packages define identical (or nearly identical) glyphs with the same symbol name.[14]

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