

The Comprehensive L^AT_EX Symbol List

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Abstract

This document lists 5913 symbols and the corresponding L^AT_EX commands that produce them. Some of these symbols are guaranteed to be available in every L^AT_EX 2 _{ε} 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 T_EX Archive Network (<http://www.ctan.org/>).

Contents

Contents	1
1	Introduction
1.1	Document Usage
1.2	Frequently Requested Symbols
2	Body-text symbols
Table 1:	L ^A T _E X 2 _{ε} Escapable “Special” Characters
Table 2:	Predefined L ^A T _E X 2 _{ε} Text-mode Commands
Table 3:	L ^A T _E X 2 _{ε} Commands Defined to Work in Both Math and Text Mode
Table 4:	<i>AMS</i> Commands Defined to Work in Both Math and Text Mode
Table 5:	Non-ASCII Letters (Excluding Accented Letters)
Table 6:	Letters Used to Typeset African Languages
Table 7:	Letters Used to Typeset Vietnamese
Table 8:	Punctuation Marks Not Found in OT1
Table 9:	pifont Decorative Punctuation Marks
Table 10:	tipa Phonetic Symbols
Table 11:	tipx Phonetic Symbols
Table 12:	wsuipa Phonetic Symbols
Table 13:	wasysym Phonetic Symbols
Table 14:	phonetic Phonetic Symbols
Table 15:	t4phonetic Phonetic Symbols
Table 16:	semtrans Transliteration Symbols
Table 17:	Text-mode Accents
Table 18:	tipa Text-mode Accents
Table 19:	extraipa Text-mode Accents
Table 20:	wsuipa Text-mode Accents
Table 21:	phonetic Text-mode Accents
Table 22:	metre Text-mode Accents
Table 23:	t4phonetic Text-mode Accents
Table 24:	arcs Text-mode Accents
Table 25:	semtrans Accents
Table 26:	ogonek Accents
Table 27:	combelow Accents

^{*}The original version of this document was written by David Carlisle, with several additional tables provided by Alexander Holt. See Section 8.8 on page 118 for more information about who did what.

Table 28:	wsuipa Diacritics	18
Table 29:	textcomp Diacritics	18
Table 30:	textcomp Currency Symbols	18
Table 31:	marvosym Currency Symbols	18
Table 32:	wasysym Currency Symbols	18
Table 33:	G <small>IF</small> A2e Currency Symbols	19
Table 34:	teubner Currency Symbols	19
Table 35:	eurosym Euro Signs	19
Table 36:	fourier Euro Signs	19
Table 37:	textcomp Legal Symbols	19
Table 38:	cclicenses Creative Commons License Icons	19
Table 39:	textcomp Old-style Numerals	20
Table 40:	Miscellaneous textcomp Symbols	20
Table 41:	Miscellaneous wasysym Text-mode Symbols	20

3	Mathematical symbols	21
Table 42:	Math-Mode Versions of Text Symbols	21
Table 43:	cmll Unary Operators	21
Table 44:	Binary Operators	22
Table 45:	<i>AMS</i> Binary Operators	22
Table 46:	stmaryrd Binary Operators	22
Table 47:	wasysym Binary Operators	23
Table 48:	txfonts/pfxfonts Binary Operators	23
Table 49:	mathabx Binary Operators	23
Table 50:	MnSymbol Binary Operators	23
Table 51:	mathdesign Binary Operators	24
Table 52:	cmll Binary Operators	24
Table 53:	shuffle Binary Operators	24
Table 54:	ulsy Geometric Binary Operators	24
Table 55:	mathabx Geometric Binary Operators	25
Table 56:	MnSymbol Geometric Binary Operators	25
Table 57:	Variable-sized Math Operators	25
Table 58:	<i>AMS</i> Variable-sized Math Operators	26
Table 59:	stmaryrd Variable-sized Math Operators	26
Table 60:	wasysym Variable-sized Math Operators	26
Table 61:	mathabx Variable-sized Math Operators	26
Table 62:	txfonts/pfxfonts Variable-sized Math Operators	27
Table 63:	esint Variable-sized Math Operators	28
Table 64:	MnSymbol Variable-sized Math Operators	29
Table 65:	mathdesign Variable-sized Math Operators	30
Table 66:	cmll Large Math Operators	30
Table 67:	Binary Relations	30
Table 68:	<i>AMS</i> Binary Relations	30
Table 69:	<i>AMS</i> Negated Binary Relations	31
Table 70:	stmaryrd Binary Relations	31
Table 71:	wasysym Binary Relations	31
Table 72:	txfonts/pfxfonts Binary Relations	31
Table 73:	txfonts/pfxfonts Negated Binary Relations	31
Table 74:	mathabx Binary Relations	32
Table 75:	mathabx Negated Binary Relations	32
Table 76:	MnSymbol Binary Relations	32
Table 77:	MnSymbol Negated Binary Relations	33
Table 78:	mathtools Binary Relations	34
Table 79:	turnstile Binary Relations	35
Table 80:	trsym Binary Relations	36
Table 81:	trfsigns Binary Relations	36
Table 82:	cmll Binary Relations	36
Table 83:	colonequals Binary Relations	36

Table 84:	fourier Binary Relations	36
Table 85:	Subset and Superset Relations	36
Table 86:	<i>AMS</i> Subset and Superset Relations	36
Table 87:	stmaryrd Subset and Superset Relations	37
Table 88:	wasysym Subset and Superset Relations	37
Table 89:	txfonts/pxfonts Subset and Superset Relations	37
Table 90:	mathabx Subset and Superset Relations	37
Table 91:	MnSymbol Subset and Superset Relations	37
Table 92:	Inequalities	37
Table 93:	<i>AMS</i> Inequalities	38
Table 94:	wasysym Inequalities	38
Table 95:	txfonts/pxfonts Inequalities	38
Table 96:	mathabx Inequalities	38
Table 97:	MnSymbol Inequalities	39
Table 98:	<i>AMS</i> Triangle Relations	39
Table 99:	stmaryrd Triangle Relations	40
Table 100:	mathabx Triangle Relations	40
Table 101:	MnSymbol Triangle Relations	40
Table 102:	Arrows	41
Table 103:	Harpoons	41
Table 104:	textcomp Text-mode Arrows	41
Table 105:	<i>AMS</i> Arrows	41
Table 106:	<i>AMS</i> Negated Arrows	41
Table 107:	<i>AMS</i> Harpoons	41
Table 108:	stmaryrd Arrows	42
Table 109:	txfonts/pxfonts Arrows	42
Table 110:	mathabx Arrows	42
Table 111:	mathabx Negated Arrows	42
Table 112:	mathabx Harpoons	43
Table 113:	MnSymbol Arrows	43
Table 114:	MnSymbol Negated Arrows	44
Table 115:	MnSymbol Harpoons	46
Table 116:	MnSymbol Negated Harpoons	46
Table 117:	harpoon Extensible Harpoons	47
Table 118:	chemarrow Arrows	47
Table 119:	fge Arrows	47
Table 120:	MnSymbol Spoons	47
Table 121:	MnSymbol Pitchforks	47
Table 122:	MnSymbol Smiles and Frowns	48
Table 123:	ulsy Contradiction Symbols	48
Table 124:	Extension Characters	48
Table 125:	stmaryrd Extension Characters	48
Table 126:	txfonts/pxfonts Extension Characters	48
Table 127:	mathabx Extension Characters	49
Table 128:	Log-like Symbols	49
Table 129:	<i>AMS</i> Log-like Symbols	49
Table 130:	QFA2e Number Sets	49
Table 131:	Greek Letters	50
Table 132:	<i>AMS</i> Greek Letters	50
Table 133:	txfonts/pxfonts Upright Greek Letters	50
Table 134:	upgreek Upright Greek Letters	51
Table 135:	fourier Variant Greek Letters	51
Table 136:	txfonts/pxfonts Variant Latin Letters	51
Table 137:	<i>AMS</i> Hebrew Letters	51
Table 138:	MnSymbol Hebrew Letters	51
Table 139:	Letter-like Symbols	51
Table 140:	<i>AMS</i> Letter-like Symbols	52

Table 141:	<code>txfonts/pxfonts</code>	Letter-like Symbols	52
Table 142:	<code>mathabx</code>	Letter-like Symbols	52
Table 143:	<code>MnSymbol</code>	Letter-like Symbols	52
Table 144:	<code>trfsigns</code>	Letter-like Symbols	52
Table 145:	<code>mathdesign</code>	Letter-like Symbols	52
Table 146:	<code>fge</code>	Letter-like Symbols	53
Table 147:	<code>fourier</code>	Letter-like Symbols	53
Table 148:	<i>AMS</i>	Delimiters	53
Table 149:	<code>stmaryrd</code>	Delimiters	53
Table 150:	<code>mathabx</code>	Delimiters	53
Table 151:	<code>nath</code>	Delimiters	53
Table 152:		Variable-sized Delimiters	54
Table 153:		Large, Variable-sized Delimiters	54
Table 154:	<i>AMS</i>	Variable-sized Delimiters	54
Table 155:	<code>stmaryrd</code>	Variable-sized Delimiters	54
Table 156:	<code>mathabx</code>	Variable-sized Delimiters	55
Table 157:	<code>MnSymbol</code>	Variable-sized Delimiters	55
Table 158:	<code>mathdesign</code>	Variable-sized Delimiters	56
Table 159:	<code>nath</code>	Variable-sized Delimiters (Double)	56
Table 160:	<code>nath</code>	Variable-sized Delimiters (Triple)	57
Table 161:	<code>fourier</code>	Variable-sized Delimiters	57
Table 162:	<code>textcomp</code>	Text-mode Delimiters	57
Table 163:	<code>metre</code>	Text-mode Delimiters	57
Table 164:		Math-mode Accents	57
Table 165:	<i>AMS</i>	Math-mode Accents	58
Table 166:	<code>MnSymbol</code>	Math-mode Accents	58
Table 167:	<code>fge</code>	Math-mode Accents	58
Table 168:	<code>yhmath</code>	Math-mode Accents	58
Table 169:		Extensible Accents	59
Table 170:	<code>overrightarrow</code>	Extensible Accents	59
Table 171:	<code>yhmath</code>	Extensible Accents	59
Table 172:	<i>AMS</i>	Extensible Accents	59
Table 173:	<code>MnSymbol</code>	Extensible Accents	60
Table 174:	<code>mathtools</code>	Extensible Accents	60
Table 175:	<code>mathabx</code>	Extensible Accents	60
Table 176:	<code>fourier</code>	Extensible Accents	60
Table 177:	<code>esvect</code>	Extensible Accents	61
Table 178:	<code>undertilde</code>	Extensible Accents	61
Table 179:	<code>ushort</code>	Extensible Accents	61
Table 180:	<i>AMS</i>	Extensible Arrows	61
Table 181:	<code>mathtools</code>	Extensible Arrows	62
Table 182:	<code>chemarr</code>	Extensible Arrows	62
Table 183:	<code>chemarrow</code>	Extensible Arrows	62
Table 184:	<code>extarrows</code>	Extensible Arrows	62
Table 185:	<code>extpfeil</code>	Extensible Arrows	63
Table 186:	<code>DotArrow</code>	Extensible Arrows	63
Table 187:	<code>trfsigns</code>	Extensible Transform Symbols	63
Table 188:	<code>holtpolt</code>	Non-commutative Division Symbols	63
Table 189:		Dots	63
Table 190:	<i>AMS</i>	Dots	64
Table 191:	<code>wasysym</code>	Dots	64
Table 192:	<code>MnSymbol</code>	Dots	64
Table 193:	<code>mathdots</code>	Dots	64
Table 194:	<code>yhmath</code>	Dots	64
Table 195:	<code>teubner</code>	Dots	64
Table 196:	<code>mathcomp</code>	Math Symbols	65
Table 197:	<code>marvosym</code>	Digits	65

Table 198: <i>fge</i> Digits	65
Table 199: <i>dozenal</i> Base-12 Digits	65
Table 200: <i>mathabx</i> Mayan Digits	65
Table 201: Miscellaneous L ^A T _E X 2 _E Math Symbols	65
Table 202: Miscellaneous <i>AMS</i> Math Symbols	66
Table 203: Miscellaneous <i>wasysym</i> Math Symbols	66
Table 204: Miscellaneous <i>txfonts/pffonts</i> Math Symbols	66
Table 205: Miscellaneous <i>mathabx</i> Math Symbols	66
Table 206: Miscellaneous <i>MnSymbol</i> Math Symbols	66
Table 207: Miscellaneous Internal <i>MnSymbol</i> Math Symbols	67
Table 208: Miscellaneous <i>textcomp</i> Text-mode Math Symbols	67
Table 209: Miscellaneous <i>marvosym</i> Math Symbols	67
Table 210: Miscellaneous <i>fge</i> Math Symbols	67
Table 211: Miscellaneous <i>mathdesign</i> Math Symbols	67
Table 212: Miscellaneous <i>arev</i> Math Symbols	67
Table 213: Math Alphabets	68
4 Science and technology symbols	70
Table 214: <i>gensymb</i> Symbols Defined to Work in Both Math and Text Mode	70
Table 215: <i>wasysym</i> Electrical and Physical Symbols	70
Table 216: <i>ifsym</i> Pulse Diagram Symbols	70
Table 217: <i>ar</i> Aspect Ratio Symbol	70
Table 218: <i>textcomp</i> Text-mode Science and Engineering Symbols	70
Table 219: <i>steinmetz</i> Extensible Phasor Symbol	70
Table 220: <i>wasysym</i> Astronomical Symbols	71
Table 221: <i>marvosym</i> Astronomical Symbols	71
Table 222: <i>mathabx</i> Astronomical Symbols	71
Table 223: <i>wasysym</i> APL Symbols	71
Table 224: <i>wasysym</i> APL Modifiers	71
Table 225: <i>marvosym</i> Computer Hardware Symbols	72
Table 226: <i>keystroke</i> Computer Keys	72
Table 227: <i>ascii</i> Control Characters (CP437)	72
Table 228: <i>milstd</i> Logic Gates	73
Table 229: <i>marvosym</i> Communication Symbols	73
Table 230: <i>marvosym</i> Engineering Symbols	73
Table 231: <i>wasysym</i> Biological Symbols	73
Table 232: <i>marvosym</i> Biological Symbols	74
Table 233: <i>marvosym</i> Safety-related Symbols	74
Table 234: <i>feyn</i> Feynman Diagram Symbols	74
5 Dingbats	75
Table 235: <i>bding</i> Arrows	75
Table 236: <i>pifont</i> Arrows	75
Table 237: <i>universal</i> Arrows	75
Table 238: <i>marvosym</i> Scissors	75
Table 239: <i>bding</i> Scissors	75
Table 240: <i>pifont</i> Scissors	75
Table 241: <i>dingbat</i> Pencils	76
Table 242: <i>bding</i> Pencils and Nibs	76
Table 243: <i>pifont</i> Pencils and Nibs	76
Table 244: <i>dingbat</i> Fists	76
Table 245: <i>bding</i> Fists	76
Table 246: <i>pifont</i> Fists	76
Table 247: <i>fourier</i> Fists	76
Table 248: <i>bding</i> Crosses and Plusses	76
Table 249: <i>pifont</i> Crosses and Plusses	77
Table 250: <i>bding</i> Xs and Check Marks	77
Table 251: <i>pifont</i> Xs and Check Marks	77

Table 252: <code>wasysym</code> Xs and Check Marks	77
Table 253: <code>universal</code> Xs	77
Table 254: <code>pifont</code> Circled Numbers	77
Table 255: <code>wasysym</code> Stars	77
Table 256: <code>bbdng</code> Stars, Flowers, and Similar Shapes	78
Table 257: <code>pifont</code> Stars, Flowers, and Similar Shapes	78
Table 258: <code>fourier</code> Ornaments	78
Table 259: <code>wasysym</code> Geometric Shapes	78
Table 260: <code>MnSymbol</code> Geometric Shapes	79
Table 261: <code>ifsym</code> Geometric Shapes	79
Table 262: <code>bbdng</code> Geometric Shapes	80
Table 263: <code>pifont</code> Geometric Shapes	80
Table 264: <code>universa</code> Geometric Shapes	80
Table 265: <code>universal</code> Geometric Shapes	80
Table 266: Miscellaneous <code>dingbat</code> Dingbats	80
Table 267: Miscellaneous <code>bbdng</code> Dingbats	80
Table 268: Miscellaneous <code>pifont</code> Dingbats	80
6 Ancient languages	81
Table 269: <code>phaistos</code> Symbols from the Phaistos Disk	81
Table 270: <code>protosem</code> Proto-Semitic Characters	81
Table 271: <code>hieroglif</code> Hieroglyphics	82
Table 272: <code>linearA</code> Linear A Script	82
Table 273: <code>linearb</code> Linear B Basic and Optional Letters	85
Table 274: <code>linearb</code> Linear B Numerals	85
Table 275: <code>linearb</code> Linear B Weights and Measures	85
Table 276: <code>linearb</code> Linear B Ideograms	86
Table 277: <code>linearb</code> Unidentified Linear B Symbols	86
Table 278: <code>cypriot</code> Cypriot Letters	86
Table 279: <code>sarabian</code> South Arabian Letters	87
Table 280: <code>teubner</code> Archaic Greek Letters and Greek Numerals	87
7 Other symbols	88
Table 281: <code>textcomp</code> Genealogical Symbols	88
Table 282: <code>wasysym</code> General Symbols	88
Table 283: <code>wasysym</code> Circles	88
Table 284: <code>wasysym</code> Musical Symbols	88
Table 285: <code>arev</code> Musical Symbols	88
Table 286: <code>harmony</code> Musical Symbols	89
Table 287: <code>harmony</code> Musical Accents	89
Table 288: <code>manfnt</code> Dangerous Bend Symbols	89
Table 289: Miscellaneous <code>manfnt</code> Symbols	89
Table 290: <code>marvosym</code> Navigation Symbols	90
Table 291: <code>marvosym</code> Laundry Symbols	90
Table 292: <code>marvosym</code> Information Symbols	90
Table 293: Other <code>marvosym</code> Symbols	90
Table 294: Miscellaneous <code>universa</code> Symbols	90
Table 295: Miscellaneous <code>universal</code> Symbols	90
Table 296: Miscellaneous <code>fourier</code> Symbols	91
Table 297: <code>ifsym</code> Weather Symbols	91
Table 298: <code>ifsym</code> Alpine Symbols	91
Table 299: <code>ifsym</code> Clocks	91
Table 300: Other <code>ifsym</code> Symbols	92
Table 301: <code>clock</code> Clocks	92
Table 302: <code>epsdice</code> Dice	92
Table 303: <code>hhcount</code> Dice	92
Table 304: <code>hhcount</code> Tally Markers	92
Table 305: <code>skull</code> Symbols	93

Table 306: Non-Mathematical <code>mathabx</code> Symbols	93
Table 307: <code>skak</code> Chess Informator Symbols	93
Table 308: <code>skak</code> Chess Pieces and Chessboard Squares	94
Table 309: <code>igo</code> Go Stones	94
Table 310: <code>metre</code> Metrical Symbols	95
Table 311: <code>metre</code> Small and Large Metrical Symbols	95
Table 312: <code>teubner</code> Metrical Symbols	95
Table 313: <code>dictsym</code> Dictionary Symbols	96
Table 314: <code>simpsons</code> Characters from <i>The Simpsons</i>	96
Table 315: <code>pmboxdraw</code> Box-Drawing Symbols	97
Table 316: <code>staves</code> Magical Staves	97
Table 317: <code>pigpen</code> Cipher Symbols	98
Table 318: <code>GrNA2e</code> Phases of the Moon	98
Table 319: Other <code>GrNA2e</code> Symbols	98
Table 320: <code>recycle</code> Recycling Symbols	99
8 Additional Information	100
8.1 Symbol Name Clashes	100
8.2 Resizing symbols	100
8.3 Where can I find the symbol for ...?	100
8.4 Math-mode spacing	112
8.5 Bold mathematical symbols	113
8.6 ASCII and Latin 1 quick reference	114
8.7 Unicode characters	117
8.8 About this document	118
8.9 Copyright and license	121
References	122
Index	123

1 Introduction

Welcome to the Comprehensive L^AT_EX Symbol List! This document strives to be your primary source of L^AT_EX symbol information: font samples, L^AT_EX 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 T_EX Archive Network (<http://www.ctan.org>).
2. All of their symbols have L^AT_EX 2_E 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 L^AT_EX Symbol List contains samples of 5913 symbols—quite a large number. Some of these symbols are guaranteed to be available in every L^AT_EX 2_E 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 L^AT_EX 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 39, “textcomp Old-Style Numerals”, are made available by putting “`\usepackage{textcomp}`” in your document's preamble. “*AMS*” means to use the *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 L^AT_EX) 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 8 contains some additional information about the symbols in this document. It discusses how certain mathematical symbols can vary in height, 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, compares various schemes for boldfacing symbols, presents L^AT_EX ASCII and Latin 1 tables, shows how to input and output Unicode characters, and provides some information about this document itself. The Comprehensive L^AT_EX 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	„·	64
í, ï, ī, î, etc. (versus í, ï, ī, and î)	14	°, as in “180°” or “15°C”	67
¢	18	Ł, Į, etc.	68
€	18	N, Z, R, etc.	68
©, ®, and ™	19	ż	68
%	20	f	105
ƒ	27	á, è, etc. (i.e., several accents per character)	107
..	30	<, >, and (instead of i, i, and —)	114
:= and ::=	31	^ and ~ (or ∼)	115
≤ and ≥	38		

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: L^AT_EX 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 L^AT_EX 2 _{ε} Text-mode Commands

^	\textasciicircum*	<	\textless
~	\textasciitilde*	a	\textordfeminine
*	\textasteriskcentered	o	\textordmasculine
\	\textbackslash	\P	\textparagraph†
	\textbar	.	\textperiodcentered
{	\textbraceleft†	¿	\textquestiondown
}	\textbraceright†	“	\textquotedblleft
•	\textbullet	”	\textquotedblright
©	\textcopyright†	‘	\textquotefirst
†	\textdagger†	,	\textquoteright
‡	\textdaggerdbl†	\textcircledR	\textregistered
\$	\textdollar†	§	\textsection†
...	\textellipsis†	\textsterling†	
—	\textemdash	\textTM	\texttrademark
–	\textendash	–	\textunderscore†
¡	\textexclamdown	–	\textvisiblespace
>	\textgreater		

Where two symbols are present, the left one is the “faked” symbol that L^AT_EX 2 _{ε} provides by default, and the right one is the “true” symbol that `textcomp` makes available.

* \^{} and \~{} can be used instead of \textasciicircum and \textasciitilde. See the discussion of “~” on page 115.

† 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: L^AT_EX 2 _{ε} Commands Defined to Work in Both Math and Text Mode

\$	\\$	-	_	\ddag	{	\{
\P	\P	\textcircledC	\textcircledC	\copyright	\dots	\dots
\S	\S	\dag	\dag	\ddag	\pounds	\}

Where two symbols are present, the left one is the “faked” symbol that L^AT_EX 2 _{ε} provides by default, and the right one is the “true” symbol that `textcomp` makes available.

TABLE 4: *AMS* Commands Defined to Work in Both Math and Text Mode

✓ \checkmark ® \circledR ✕ \maltese

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

å	\aa	D	\DH*	L	\L	ø	\o	ß	\ss
Å	\AA	ð	\dh*	ł	\l	Ø	\o	SS	\ss
Æ	\AE	Đ	\DJ*	Ĳ	\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

D	\B{D}	ɛ	\m{c}	f	\m{f}	k	\m{k}	t	\M{t}	z	\m{Z}
đ	\B{d}	Đ	\m{D}	F	\m{F}	Ĳ	\m{N}	Ț	\M{T}	Ξ	\T{E}
H	\B{H}	ɖ	\M{d}	Ɣ	\m{G}	ŋ	\m{n}	ڻ	\m{t}	ڦ	\T{e}
ڻ	\B{h}	ڏ	\M{D}	ڻ	\m{g}	ڙ	\m{o}	ڻ	\m{T}	ڦ	\T{O}
t	\B{t}	ڏ	\m{d}	ڻ	\m{I}	ڻ	\m{O}	ڻ	\m{u}	ڻ	\T{o}
T	\B{T}	ڦ	\m{E}	ڻ	\m{i}	ڻ	\m{P}	ڻ	\m{U}	ڻ	\T{U}*
b	\m{b}	ڦ	\m{e}	ڻ	\m{J}	ڦ	\m{p}	ڻ	\m{Y}	ڦ	\m{Y}
B	\m{B}	ڦ	\M{E}	ڻ	\m{j}	ڻ	\m{s}	ڻ	\m{y}	ڦ	\m{y}
ڦ	\m{C}	ڦ	\M{e}	K	\m{K}	ڻ	\m{S}	ڦ	\m{z}	ڦ	\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

Ӧ \OHORN Ӧ \ohorn Ӧ \UHORN Ӧ \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

γ	\textbabygamma	?	\textglotstop	η	\textrtailn
β	\textbarb	·	\texthalflength	ℓ	\textrtailr
ε	\textbarc	ˇ	\texthardsign	ſ	\textrtails
đ	\textbard	ˇ	\texthooktop	č	\textrtailt
᷂	\textbardotlessj	᷁	\texthtb	ȝ	\textrtailz
᷃	\textbarg	᷄	\texthtbardotlessj	᷅	\textrthook
᷆	\textbarglotstop	᷇	\texthtc	᷈	\textsca
᷉	\textbari	᷊	\texthtd	᷋	\textscb
᷊	\textbarl	᷌	\texthtg	᷌	\textscce
᷋	\textbaro	᷍	\texthth	᷌	\textscg
᷎	\textbarrevglotstop	᷏	\texththeng	᷌	\textsch
᷏	\textbaru	᷐	\texthtk	᷌	\textschwa
᷑	\textbeltl	᷒	\texthtp	᷌	\textsci
᷒	\textbeta	ᷓ	\texthtq	᷌	\textscj
ᷔ	\textbullseye	ᷔ	\texthttaild	᷌	\textscsl
ᷕ	\textcelpal	ᷕ	\texthtscg	᷌	\textscn
ᷖ	\textchi	ᷖ	\texthttt	᷌	\textscelig
ᷗ	\textcloseepsilon	ᷗ	\texthvlig	᷌	\textscomega
ᷘ	\textcloseomega	ᷘ	\textinvglotstop	᷌	\textscr
ᷙ	\textcloserevepsilon	ᷙ	\textinvscr	᷌	\textscripta
ᷚ	\textcommatailz	ᷚ	\textiota	᷌	\textscriptg
ᷛ	\textcorner	ᷛ	\textlambda	᷌	\textscriptv
ᷜ	\textcrb	ᷜ	\textlengthmark	᷌	\textscu
ᷝ	\textcrd	ᷝ	\textlhooft	᷌	\textscy
ᷞ	\textcrg	ᷞ	\textlhtlongi	᷌	\textsecstress
ᷟ	\textcrh	ᷟ	\textlhtlongy	᷌	\textsoftsign
ᷟ	\textcrinvglotstop	ᷟ	\textlonglegr	᷌	\textstretchc
ᷟ	\textcrlambda	ᷟ	\textlptr	᷌	\texttctclig
ᷟ	\textcrtwo	ᷟ	\textltailm	᷌	\textteshlig
ᷟ	\textctc	ᷟ	\textltailn	᷌	\texttheta
ᷟ	\textctd	ᷟ	\textltilde	᷌	\textthorn
ᷟ	\textcdctzlig	ᷟ	\textlyoghlig	᷌	\texttoneletterstem
ᷟ	\textctesh	ᷟ	\textobardotlessj	᷌	\texttslig
ᷟ	\textctj	ᷟ	\textolyoghlig	᷌	\textturna
ᷟ	\textctn	ᷟ	\textomega	᷌	\textturncelig
ᷟ	\textctt	ᷟ	\textopencorner	᷌	\textturnh
ᷟ	\textcttcclig	ᷟ	\textopeno	᷌	\textturnk
ᷟ	\textctyogh	ᷟ	\textpalhook	᷌	\textturnlonglegr
ᷟ	\textctz	ᷟ	\textphi	᷌	\textturnnm
ᷟ	\textdctzlig	ᷟ	\textpipe	᷌	\textturnmrleg
ᷟ	\textdoublebaresh	ᷟ	\textprimstress	᷌	\textturnnr
ᷟ	\textdoublebarpipe	ᷟ	\textraiseglotstop	᷌	\textturnrrtail
ᷟ	\textdoublebarslash	ᷟ	\textraisevibyi	᷌	\textturnscripta
ᷟ	\textdoublepipe	ᷟ	\textramshorns	᷌	\textturnrt
ᷟ	\textdoublevertline	ᷟ	\textrevapostrophe	᷌	\textturnv
ᷟ	\textdownstep	ᷟ	\textreve	᷌	\textturnw
ᷟ	\textdyoghlig	ᷟ	\textrevespsilon	᷌	\textturny
ᷟ	\textdzlig	ᷟ	\textrevglotstop	᷌	\textupsilon
ᷟ	\textepsilon	ᷟ	\textreveyogh	᷌	\textupstep

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ſ	\textesh	ȝ	\textrhookrevepsilon		\textvertline
ꝑ	\textfishhookr	ꝓ	\textrhookschwa	ꝑ	\textvibyi
ꝑ	\texttg	Ꝕ	\textrhicity	ꝑ	\textvibyy
ꝑ	\textgamma	ꝕ	\textrptr	ꝑ	\textwynn
ꝑ	\textglobfall	Ꝗ	\textrtaild	ꝑ	\textyogh
ꝑ	\textglobrise	ꝗ	\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

ꝑ	\textaolig	ጀ	\texthtbarlessjvar	ጀ	\textrthooklong
ꝑ	\textbenttailyogh	ጀ	\textinvomega	ጀ	\textscaolig
ꝑ	\textbktailgamma	ጀ	\textinvscा	ጀ	\textscdelta
ጀ	\textctinvglotstop	ጀ	\textinvscripta	ጀ	\textscf
ጀ	\textctjvar	ጀ	\textlfishhookrlig	ጀ	\textscck
ጀ	\textctstretchc	ጀ	\textlhookfour	ጀ	\textscm
ጀ	\textctstretchcvar	ጀ	\textlhookp	ጀ	\textscp
ጀ	\textctturnt	ጀ	\textlhti	ጀ	\textscq
ጀ	\textdblig	ጀ	\textlooptoprevesh	ጀ	\textspleftarrow
ጀ	\textdoublebarpipevar	ጀ	\textnrleg	ጀ	\textstetchcvar
ጀ	\textdoublelepipevar	ጀ	\textObullseye	ጀ	\textsubdoublearrow
ጀ	\textdownfullarrow	ጀ	\textpalhooklong	ጀ	\textsubrightarrow
ጀ	\textfemale	ጀ	\textpalhookvar	ጀ	\textthornvari
ጀ	\textfrbarn	ጀ	\textpipevar	ጀ	\textthornvarii
ጀ	\textfrhookd	ጀ	\textqlig	ጀ	\textthornvariii
ጀ	\textfrhookdvar	ጀ	\textrectangle	ጀ	\textthornvariv
ጀ	\textfrhookt	ጀ	\textretractingvar	ጀ	\textturnglotstop
ጀ	\textfrtailgamma	ጀ	\textrevscl	ጀ	\textturnsck
ጀ	\textglotstopvari	ጀ	\textrevscr	ጀ	\textturnscu
ጀ	\textglotstopvari	ጀ	\textrhooka	ጀ	\textturnthree
ጀ	\textglotstopvari	ጀ	\textrooke	ጀ	\textturntwo
ጀ	\textgrgamma	ጀ	\textrhoekpsilon	ጀ	\textuncrfemale
ጀ	\texttheng	ጀ	\textrhookopeno	ጀ	\textupfullarrow
ጀ	\texthmlig	ጀ	\textrtailhth		

TABLE 12: `wsuipa` Phonetic Symbols

ς	\babymu	η	\eng	ŋ	\labdentalnas	ə	\schwa
ϐ	\barb	ϐ	\er	ϐ	\latfric	ϐ	\sci
ϐ	\bard	ϐ	\esh	ϐ	\legm	ϐ	\scn
ϐ	\bari	ϐ	\eth	ϐ	\legr	ϐ	\scr
ϐ	\barl	ϐ	\flapr	ϐ	\lz	ϐ	\scripta
ϐ	\baro	ϐ	\glotstop	ϐ	\nialpha	ϐ	\scriptg
ϐ	\barp	ϐ	\hookb	ϐ	\nibeta	ϐ	\scriptv
ϐ	\barsci	ϐ	\hookd	ϐ	\nichi	ϐ	\scu
ϐ	\barscu	ϐ	\hookg	ϐ	\niepsilon	ϐ	\scy
ϐ	\baru	ϐ	\hookh	ϐ	\nigamma	ϐ	\slashb
ϐ	\clickb	ϐ	\hookheng	ϐ	\niota	ϐ	\slashc
ϐ	\clickc	ϐ	\hookrevepsilon	ϐ	\nilambda	ϐ	\slashd
ϐ	\clickt	ϐ	\hv	ϐ	\niomega	ϐ	\slashu
ϐ	\closedniomega	ϐ	\inva	ϐ	\niph	ϐ	\taild
ϐ	\closedrevepsilon	ϐ	\invf	ϐ	\nisigma	ϐ	\tailinvr
ϐ	\crossb	ϐ	\invglotstop	ϐ	\nitheta	ϐ	\taill
ϐ	\crossd	ϐ	\invh	ϐ	\niupsilon	ϐ	\tailn
ϐ	\crosssh	ϐ	\invlegr	ϐ	\nj	ϐ	\tailr
ϐ	\crossnilambda	ϐ	\invm	ϐ	\oo	ϐ	\tails
ϐ	\curlyc	ϐ	\invr	ϐ	\openo	ϐ	\tailt
ϐ	\curlyesh	ϐ	\invscr	ϐ	\reve	ϐ	\tailz
ϐ	\curlyyogh	ϐ	\invscripta	ϐ	\rereject	ϐ	\tesh
ϐ	\curlyz	ϐ	\invv	ϐ	\revepsilon	ϐ	\thorn
ϐ	\dlbari	ϐ	\invw	ϐ	\revglotstop	ϐ	\tilde{d}
ϐ	\dz	ϐ	\invy	ϐ	\scd	ϐ	\yogh
ϐ	\ejective	ϐ	\ipagamma	ϐ	\scg	ϐ	

TABLE 13: `wasysym` Phonetic Symbols

D	\DH	ϐ	\dh	ϐ	\openo
ϐ	\Thorn	ϐ	\inve	ϐ	\thorn

TABLE 14: `phonetic` Phonetic Symbols

ϐ	\barj	ϐ	\flap	ϐ	\ibar	ϐ	\rotvara	ϐ	\vari
ϐ	\barlambda	ϐ	\glottal	ϐ	\openo	ϐ	\rotw	ϐ	\varomega
ϐ	\emgma	ϐ	\hausaB	ϐ	\planck	ϐ	\roty	ϐ	\varopeno
ϐ	\engma	ϐ	\hausab	ϐ	\pwedge	ϐ	\schwa	ϐ	\vod
ϐ	\enya	ϐ	\hausad	ϐ	\revD	ϐ	\thorn	ϐ	\voicedh
ϐ	\epsi	ϐ	\hausaD	ϐ	\riota	ϐ	\ubar	ϐ	\yogh
ϐ	\esh	ϐ	\hausak	ϐ	\rotm	ϐ	\udesc	ϐ	
ϐ	\eth	ϐ	\hausaK	ϐ	\rotOmega	ϐ	\vara	ϐ	
ϐ	\fj	ϐ	\hookd	ϐ	\rotr	ϐ	\varg	ϐ	

TABLE 15: t4phonet Phonetic Symbols

đ	\textcrd	đ	\texthtd		\textpipe
ḥ	\textcrh	ḁ	\texthtk	ḑ	\textrtaild
ε	\textepsilon	ɸ	\texthtp	ት	\textrtailt
ʃ	\textesh	ť	\texthtt	đ	\textschwa
ѓ	\textfjlig	ı	\textiota	ſ	\textscriptv
Ծ	\texthtb	ң	\textltailn	Ծ	\textteshlig
Ը	\texthtc	օ	\textopeno	զ	\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 16: semtrans Transliteration Symbols

› \Alif ‹ \Ayn

TABLE 17: Text-mode Accents

Ää	\'{A}\\"{a}	Àà	\`{A}\`{a}	Ãä	\d{A}\d{a}	Åå	\r{A}\r{a}
Áá	\'{A}\'{a}	Àá	\`{A}\`{a}‡	Ãá	\G{A}\G{a}‡	Åá	\t{A}\t{a}
Àá	\.{A}\.{a}	Ãá	\~{A}\~{a}	Ãá	\h{A}\h{a}§	Ãá	\u{A}\u{a}
Āā	\={A}\={a}	Àá	\b{A}\b{a}	Ãá	\H{A}\H{a}	Ãá	\U{A}\U{a}‡
Ââ	\^{A}\^{a}	Ãá	\c{A}\c{a}	Ãâ	\k{A}\k{a}†	Ãâ	\v{A}\v{a}
	Ââ \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., “i” and “j”). These are useful when the accent is supposed to replace the dot in encodings that need to composite (i.e., combine) letters and accents. For example, “na\"{\i}ve” always produces a correct “naïve”, while “na\"{\i}ve” yields the rather odd-looking “naï̄e” when using the OT1 font encoding and older versions of LATEX. Font encodings other than OT1 and newer versions of LATEX properly typeset “na\"{\i}ve” as “naïve”.

TABLE 18: tipa Text-mode Accents

Áá	\textacute{A}\textacute{a}
Áá	\textacuteewedge{A}\textacuteewedge{a}
Áa	\textadvancing{A}\textadvancing{a}
Áa	\textbottomtiebar{A}\textbottomtiebar{a}
Áá	\textbrevemacron{A}\textbrevemacron{a}
Áä	\textcircumacute{A}\textcircumacute{a}
Ââ	\textcircumdot{A}\textcircumdot{a}
Ãä	\textdotacute{A}\textdotacute{a}
Ãå	\textdotbreve{A}\textdotbreve{a}
Ãä	\textdoublegrave{A}\textdoublegrave{a}
Ãä	\textdoublevbaraccent{A}\textdoublevbaraccent{a}
Ãä	\textgravecircum{A}\textgravecircum{a}
Ãä	\textgravedot{A}\textgravedot{a}
Ãà	\textgravemacron{A}\textgravemacron{a}
Ãä	\textgravemid{A}\textgravemid{a}
Ãa	\textinvsubbridge{A}\textinvsubbridge{a}
Ãa	\textlowering{A}\textlowering{a}
Ãá	\textmidacute{A}\textmidacute{a}
Ãä	\textovercross{A}\textovercross{a}
Ãä	\textoverw{A}\textoverw{a}
Ãä	\textpolhook{A}\textpolhook{a}
Ãa	\textraising{A}\textraising{a}
Ãa	\textr retracting{A}\textr retracting{a}
Ãä	\textringmacron{A}\textringmacron{a}
Ââ	\textroundcap{A}\textroundcap{a}
Ãa	\textseagull{A}\textseagull{a}
Ãa	\textsubacute{A}\textsubacute{a}
Ãa	\textsubarch{A}\textsubarch{a}
Ãa	\textsubbar{A}\textsubbar{a}
Ãa	\textsubbridge{A}\textsubbridge{a}
Ãa	\textsubcircum{A}\textsubcircum{a}
Ãä	\textsubdot{A}\textsubdot{a}
Ãä	\textsubgrave{A}\textsubgrave{a}
Ãä	\textsublhalfring{A}\textsublhalfring{a}
Ãä	\textsubplus{A}\textsubplus{a}
Ãä	\textsubrhalfring{A}\textsubrhalfring{a}
Ãa	\textsubring{A}\textsubring{a}
Ãa	\textsubsquare{A}\textsubsquare{a}
Ãa	\textsubtilde{A}\textsubtilde{a}
Ãa	\textsubumlaut{A}\textsubumlaut{a}

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$\text{A}\ddot{\text{a}}$	<code>\textsubw{A}\textsubw{a}</code>
$\text{A}\dot{\text{a}}$	<code>\textsubwedge{A}\textsubwedge{a}</code>
$\text{A}\bar{\text{a}}$	<code>\textsuperimpose{\tilde{A}}\textsuperimpose{\tilde{a}}</code>
$\text{A}\dot{\text{a}}$	<code>\textsyllabic{A}\textsyllabic{a}</code>
$\text{A}\widetilde{\text{a}}$	<code>\texttildedot{A}\texttildedot{a}</code>
$\widehat{\text{A}}\dot{\text{a}}$	<code>\texttoptiebar{A}\texttoptiebar{a}</code>
$\dot{\text{A}}\dot{\text{a}}$	<code>\textvbaraccent{A}\textvbaraccent{a}</code>

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

TABLE 19: extraipa Text-mode Accents

$\text{A}\bar{\text{a}}$	<code>\bibridge{A}\bibridge{a}</code>	$\text{A}\overset{\circ}{\text{a}}$	<code>\partvoiceless{A}\partvoiceless{a}</code>
$\text{A}\acute{\text{a}}$	<code>\crttilde{A}\crttilde{a}</code>	$\text{A}\overset{\circ}{\text{a}}$	<code>\sliding{A}\sliding{a}</code>
$\text{A}\ddot{\text{a}}$	<code>\dottedtilde{A}\dottedtilde{a}</code>	$\text{A}\overset{\circ}{\text{a}}$	<code>\spreadlips{A}\spreadlips{a}</code>
$\text{A}\widetilde{\text{a}}$	<code>\doubletilde{A}\doubletilde{a}</code>	$\text{A}\overset{\circ}{\text{a}}$	<code>\subcorner{A}\subcorner{a}</code>
$\text{A}\overset{\circ}{\text{a}}$	<code>\finpartvoice{A}\finpartvoice{a}</code>	$\text{A}\overset{\circ}{\text{a}}$	<code>\subdoublebar{A}\subdoublebar{a}</code>
$\text{A}\overset{\circ}{\text{a}}$	<code>\finpartvoiceless{A}\finpartvoiceless{a}</code>	$\text{A}\overset{\circ}{\text{a}}$	<code>\subdoublevert{A}\subdoublevert{a}</code>
$\text{A}\overset{\circ}{\text{a}}$	<code>\inipartvoice{A}\inipartvoice{a}</code>	$\text{A}\overset{\circ}{\text{a}}$	<code>\sublptr{A}\sublptr{a}</code>
$\text{A}\overset{\circ}{\text{a}}$	<code>\inipartvoiceless{A}\inipartvoiceless{a}</code>	$\text{A}\overset{\circ}{\text{a}}$	<code>\subrptr{A}\subrptr{a}</code>
$\text{A}\bar{\text{a}}$	<code>\overbridge{A}\overbridge{a}</code>	$\text{A}\overset{\circ}{\text{a}}$	<code>\whistle{A}\whistle{a}</code>
$\text{A}\overset{\circ}{\text{a}}$	<code>\partvoice{A}\partvoice{a}</code>		

TABLE 20: wsuipa Text-mode Accents

$\text{A}\overset{\circ}{\text{a}}$	<code>\dental{A}\dental{a}</code>
$\text{A}\overset{\circ}{\text{a}}$	<code>\underarch{A}\underarch{a}</code>

TABLE 21: phonetic Text-mode Accents

$\text{A}\overset{\circ}{\text{a}}$	<code>\hill{A}\hill{a}</code>	$\text{A}\overset{\circ}{\text{a}}$	<code>\rc{A}\rc{a}</code>	$\text{A}\overset{\circ}{\text{a}}$	<code>\ut{A}\ut{a}</code>
$\text{A}\overset{\circ}{\text{a}}$	<code>\odf{A}\odf{a}</code>	$\text{A}\overset{\circ}{\text{a}}$	<code>\syl{A}\syl{a}</code>		
$\text{A}\overset{\circ}{\text{a}}$	<code>\ohill{A}\ohill{a}</code>	$\text{A}\overset{\circ}{\text{a}}$	<code>\tdf{A}\tdf{a}</code>		

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 “é”. `\labvel` joins two characters with an arc: `\labvel{mn} → “m̪n”`. `\upbar` is intended to go between characters as in “x`\upbar{y}` → “x̄y”. Lastly, `\uplett` behaves like `\textsuperscript` but uses a smaller font. Contrast “p`\uplett{h}`” → “p̄” with “p`h`” → “p^h”.

TABLE 22: metre Text-mode Accents

\acute{A}	<code>\acute{A}</code>	<code>\acute{a}</code>
\check{A}	<code>\check{A}</code>	<code>\check{a}</code>
\tilde{A}	<code>\tilde{A}</code>	<code>\tilde{a}</code>
\ddot{A}	<code>\ddot{A}</code>	<code>\ddot{a}</code>
\grave{A}	<code>\grave{A}</code>	<code>\grave{a}</code>
\bar{A}	<code>\bar{A}</code>	<code>\bar{a}</code>

TABLE 23: t4phonet Text-mode Accents

$\ddot{\acute{A}}$	<code>\ddot{\acute{A}}</code>	<code>\ddot{\acute{a}}</code>
$\acute{\grave{A}}$	<code>\acute{\grave{A}}</code>	<code>\acute{\grave{a}}</code>
$\grave{\acute{A}}$	<code>\grave{\acute{A}}</code>	<code>\grave{\acute{a}}</code>

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 17 on page 14) but using the same names as the `tipa` accents presented in Table 18 on page 15.

TABLE 24: `arcs` Text-mode Accents

\widehat{A}	<code>\widehat{A}</code>	<code>\widehat{a}</code>
$\widehat{\widehat{A}}$	<code>\widehat{\widehat{A}}</code>	<code>\widehat{\widehat{a}}</code>

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 25: `semtrans` Accents

\mathring{A}	<code>\mathring{A}</code>	<code>\mathring{a}</code>
$\mathring{\mathring{A}}$	<code>\mathring{\mathring{A}}</code>	<code>\mathring{\mathring{a}}</code>

\mathring{V}

\mathring{T}

\mathring{T} is not actually an accent but a command that rotates its argument 180° using the `graphicx` package’s `\rotatebox` command.

TABLE 26: `ogonek` Accents

\dot{A}	<code>\dot{A}</code>	<code>\dot{a}</code>
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TABLE 27: `combelow` Accents

$\dot{\mathring{s}}$	<code>\dot{\mathring{s}}</code>
$\dot{\mathring{g}}$	<code>\dot{\mathring{g}}</code>

`\cb` places a comma *above* letters with descenders. Hence, while “`\cb{s}`” produces “ \dot{s} ”, “`\cb{g}`” produces “ \dot{g} ”.

TABLE 28: *wsipa* Diacritics

'	\ain	<	\leftp	'	\overring	'	\stress	'	\underwedge
‐	\corner	‐	\leftt	‐	\polishhook	‐	\syllabic	‐	\upp
‐	\downp	:	\length	>	\rightp	..	\underdots	‐	\upt
‐	\downt	‐	\midtilde	‐	\rightt	‐	\underring		
‐	\halflength	,	\open	,	\secstress	‐	\undertilde		

The *wsipa* 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 “ä”. See the *wsipa* documentation for more information.

TABLE 29: *textcomp* Diacritics

"	\textacutedbl	‐	\textasciicaron	‐	\textasciimacron
‐	\textasciiacute	‐	\textasciidieresis	‐	\textgravedbl
‐	\textasciibreve	‐	\textasciigrave		

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

TABLE 30: *textcomp* Currency Symbols

฿	\textbaht	\$	\textdollar*	₲	\textguarani	₩	\textwon
₵	\textcent	\$	\textdollaroldstyle	£	\textlira	¥	\textyen
₵	\textcentoldstyle	đ	\textdong	₦	\textnaira		
₵	\textcolonmonetary	€	\texteuro	P	\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 31: *marvosym* Currency Symbols

ℳ	\Denarius	€	\EUR	€	\EURdig	€	\EURtm	ℳ	\Pfund
ℳ	\Ecommerce	€	\EURcr	€	\EURhv	\$	\EyesDollar	ℳ	\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 197 (`\EURdig`). The *mathdesign* package redefines `\texteuro` to be visually compatible with one of three additional fonts: Utopia (€), Charter (ℳ), or Garamond (ℳ).

TABLE 32: *wasysym* Currency Symbols

₵	\cent	ℳ	\currency
---	-------	---	-----------

TABLE 33: *GoNA2e* Currency Symbols

\euro \texteuro \textpound

TABLE 34: *teubner* Currency Symbols

\denarius	\hemiobelion	\tetartemorion
\dracma	\stater	

TABLE 35: *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 36: *fourier* Euro Signs

\eurologo \texteuro

TABLE 37: *textcomp* Legal Symbols

\textcircledP	\textcircledP	\textcircledC	\textcircledC	\textcopyright	\textsm	\textservicemark
\textcircledO	\textcircledO	\textcircledR	\textcircledR	\textregistered	\textTM	\texttrademark

Where two symbols are present, the left one is the “faked” symbol that *LATEX 2\epsilon* 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 “ \textcircledR ” when you expected to get a “ \textcircledR ”).

TABLE 38: *cclicenses* Creative Commons License Icons

\textcircledCC	\textcircledCC	\textcircledBY	\textcircledBY	\textcircledNC	\textcircledNC	\textcircledND	\textcircledND	\textcircledSA	\textcircledSA
-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------	-------------------------

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

TABLE 39: `textcomp` Old-style Numerals

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

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

TABLE 40: Miscellaneous `textcomp` Symbols

*	<code>\textasteriskcentered</code>	a	<code>\textordfeminine</code>
	<code>\textbardbl</code>	o	<code>\textordmasculine</code>
○	<code>\textbigcircle</code>	¶	<code>\textparagraph*</code>
b	<code>\textblank</code>	.	<code>\textperiodcentered</code>
	<code>\textbrokenbar</code>	%oo	<code>\textpertenthousand</code>
•	<code>\textbullet</code>	%o	<code>\textperthousand</code>
†	<code>\textdagger*</code>	¶	<code>\textpilcrow</code>
‡	<code>\textdaggerdbl*</code>	'	<code>\textquotesingle</code>
=	<code>\textdblyhyphen</code>	,	<code>\textquotestraightbase</code>
=	<code>\textdblyhyphenchar</code>	"	<code>\textquotestraightdblbase</code>
%	<code>\textdiscount</code>	R	<code>\textrecipe</code>
e	<code>\textestimated</code>	⌘	<code>\textreferencemark</code>
‽	<code>\textinterrobang</code>	§	<code>\textsection*</code>
⸮	<code>\textinterrobangdown</code>	—	<code>\textthreequartersemdash</code>
♪	<code>\textmusicalnote</code>	~	<code>\texttildelow</code>
№	<code>\textnumero</code>	—	<code>\texttwelveudash</code>
◦	<code>\textopenbullet</code>		

Where two symbols are present, the left one is the “faked” symbol that L^AT_EX 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 41: Miscellaneous `wasy` Text-mode Symbols

%oo \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., “ \mathcal{L} ” and “ \mathbb{Z} ”) are usually produced using one of the math alphabets in Table 213 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 “ \nexists ” (`\blitza`), “ $\Rightarrow\Leftarrow$ ” (`\Rightarrow\Leftarrow`), “ \perp ” (`\bot`), “ \leftrightarrow ” (`\nleftrightarrow`), and “ \ast ” (`\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 ” (*various*¹), and “ $\stackrel{\text{def}}{=}$ ” (`\stackrel{\text{def}}{=}`). See also the example of `\equalsfill` on page 108. 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.² Finally, the average value of a variable x is written by some people as “ \bar{x} ” (`\overline{x}`), by some people as “ $\langle x \rangle$ ” (`\langle x \rangle`), and by some people as “ $\emptyset x$ ” 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 42: Math-Mode Versions of Text Symbols

<code>\$</code>	<code>\mathdollar</code>	<code>\P</code>	<code>\mathparagraph</code>	<code>\£</code>	<code>\mathsterling</code>
<code>...</code>	<code>\mathellipsis</code>	<code>\S</code>	<code>\mathsection</code>	<code>-</code>	<code>\mathunderscore</code>

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 43: cmll Unary Operators

<code>!</code>	<code>\oc*</code>	<code>\uparrow</code>	<code>\shneg</code>	<code>?</code>	<code>\wn*</code>
<code>\downarrow</code>	<code>\shift</code>	<code>\downarrow</code>	<code>\shpos</code>		

* `\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 “ $A = !B$ ”.

¹In `txfonts`, `pxfonts`, and `mathtools` the symbol is called `\colonneqq`. In `mathabx` and `MnSymbol` it’s called `\coloneq`. In `colonequals` it’s called `\colonequals`.

²Bob Tennent listed these and other disjoint-union symbol possibilities in a November 2007 post to `comp.text.tex`.

TABLE 44: Binary Operators

II	\amalg	U	\cup	\oplus	\otimes	\times	\times	\times
*	\ast	\dagger	\dagger	\ddagger	\oslash	\triangleleft	\triangleleft	\triangleleft
O	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\otimes	\triangleleft	\triangleleft	\triangleleft
\nabla	\bigtriangledown	\diamond	\diamond	\diamond	\pm	\triangleleft	\triangleleft	\triangleleft
\Delta	\bigtriangleup	\div	\div	\div	\rhd*	\triangleleft	\triangleleft	\triangleleft
\bullet	\bullet	\lhd*	\lhd*	\setminus	\setminus	\uplus	\uplus	\uplus
\cap	\cap	\mp	\mp	\sqcap	\sqcap	\vee	\vee	\vee
\cdot	\cdot	\odot	\odot	\sqcup	\sqcup	\wedge	\wedge	\wedge
\circ	\circ	\ominus	\ominus	\star	\star	\wr	\wr	\wr

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

TABLE 45: *AMS* Binary Operators

\barwedge	\barwedge	\circledcirc	\circledcirc	\intercal	\intercal
\boxdot	\boxdot	\circleddash	\circleddash	\leftthreetimes	\leftthreetimes
\boxminus	\boxminus	\Cup	\Cup	\ltimes	\ltimes
\boxplus	\boxplus	\curlyvee	\curlyvee	\rightthreetimes	\rightthreetimes
\boxtimes	\boxtimes	\curlywedge	\curlywedge	\rtimes	\rtimes
\Cap	\Cap	\divideontimes	\divideontimes	\smallsetminus	\smallsetminus
\centerdot	\centerdot	\dotplus	\dotplus	\veebar	\veebar
\circledast	\circledast	\doublebarwedge	\doublebarwedge		

* Some people use a superscripted `\intercal` for matrix transpose: “ A^{\intercal} ” \mapsto “ A^T ”. (See the May 2009 `comp.text.tex` thread, “raising math symbols”, for suggestions about altering the height of the superscript.) `\top` (Table 139 on page 51), `T`, and `\mathsf{T}` are other popular choices: “ A^T ”, “ A^{\top} ”, “ A^{\intercal} ”.

TABLE 46: *stmaryrd* Binary Operators

\baro	\interleave	\varoast
\bbslash	\leftslice	\varobar
\binampersand	\merge	\varobslash
\bindnasrepma	\minuso	\varocircle
\boxast	\moo	\varodot
\boxbar	\nplus	\varogreaterthan
\boxbox	\obar	\varolesthan
\boxbslash	\oblong	\varominus
\boxcircle	\obslash	\varoplus
\boxdot	\ogreaterthan	\varoslash
\boxempty	\olesthan	\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 47: `wasysym` Binary Operators

\triangleleft	<code>\lhd</code>	\circ	<code>\ocircle</code>	\triangleright	<code>\RHD</code>	\trianglerighteq	<code>\unrhd</code>
\blacktriangleleft	<code>\LHD</code>	\triangleright	<code>\rhd</code>	\trianglelefteq	<code>\unlhd</code>		

TABLE 48: `txfonts/pxfonts` Binary Operators

\oplus	<code>\circledbar</code>	\oslash	<code>\circledwedge</code>	\circ	<code>\medcirc</code>
\oslash	<code>\circledbslash</code>	\divideontimes	<code>\invamp</code>	\boxplus	<code>\sqcapplus</code>
\oslash	<code>\circledvee</code>	\bullet	<code>\medbullet</code>	\boxplus	<code>\sqcupplus</code>

TABLE 49: `mathabx` Binary Operators

$*$	<code>\ast</code>	\wedge	<code>\curlywedge</code>	\square	<code>\sqcap</code>
$*$	<code>\Asterisk</code>	\divdot	<code>\divdot</code>	\square	<code>\sqcup</code>
\wedge	<code>\barwedge</code>	\divideontimes	<code>\divideontimes</code>	\boxminus	<code>\sqdoublecap</code>
\star	<code>\bigstar</code>	\dotdiv	<code>\dotdiv</code>	\boxminus	<code>\sqdoublecup</code>
\star	<code>\bigvarstar</code>	\dotplus	<code>\dotplus</code>	\square	<code>\square</code>
\diamond	<code>\blackdiamond</code>	\dottimes	<code>\dottimes</code>	\boxplus	<code>\sqplus</code>
\cap	<code>\cap</code>	\doublebarwedge	<code>\doublebarwedge</code>	\cdot	<code>\udot</code>
\circ	<code>\circ</code>	\circledcirc	<code>\circledcirc</code>	\oplus	<code>\uplus</code>
\circ	<code>\circ</code>	\circledwedge	<code>\circledwedge</code>	\circ	<code>\varstar</code>
\circ	<code>\coAsterisk</code>	\circledtimes	<code>\circledtimes</code>	\vee	<code>\vee</code>
\circ	<code>\coAsterisk</code>	\circledcup	<code>\circledcup</code>	\circ	<code>\veebar</code>
\circ	<code>\convolution</code>	\circledcirc	<code>\circledcirc</code>	\circ	<code>\veedoublebar</code>
\cup	<code>\cup</code>	\circledtimes	<code>\circledtimes</code>	\circ	
\vee	<code>\curlyvee</code>	\sqbullet	<code>\sqbullet</code>	\wedge	<code>\wedge</code>

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 50: `MnSymbol` Binary Operators

\sqcup	<code>\amalg</code>	\sqcup	<code>\doublesqcup</code>	$\cdot\cdot$	<code>\righttherefore</code>
$*$	<code>\ast</code>	\vee	<code>\doublevee</code>	\times	<code>\rightthreetimes</code>
\times	<code>\backslashdiv</code>	\wedge	<code>\doublewedge</code>	\succ	<code>\rightY</code>
\bowtie	<code>\bowtie</code>	\therefore	<code>\downtherefore</code>	\times	<code>\rtimes</code>
\bullet	<code>\bullet</code>	\succ	<code>\downY</code>	\times	<code>\slashdiv</code>
\cap	<code>\cap</code>	\times	<code>\dtimes</code>	Π	<code>\smallprod</code>
\capdot	<code>\capdot</code>	\therefore	<code>\fivedots</code>	\square	<code>\sqcap</code>
\capplus	<code>\capplus</code>	∞	<code>\hbiopropto</code>	\square	<code>\sqcapdot</code>
\cdot	<code>\cdot</code>	\cdots	<code>\hddotdot</code>	\square	<code>\sqcapplus</code>
\circ	<code>\circ</code>	\sqcap	<code>\lefthalfcap</code>	\square	<code>\sqcup</code>

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∨	\closedcurlyvee	⊓	\lefthalfcup	⊓	\sqcupdot
∧	\closedcurlywedge	∴	\lefttherefore	⊓	\sqcupplus
∪	\cup	×	\leftthreetimes	∴	\squaredots
⊻	\cupdot	⊲	\leftY	×	\times
⊼	\cupplus	⊳	\ltimes	∴	\udotdot
∨	\curlyvee	⊸	\medbackslash	∴	\uptherefore
∨	\curlyveedot	○	\medcircle	⊸	\upY
∧	\curlywedge	⊹	\medslash	⊗	\utimes
∧	\curlywedgedot	⊷	\medvert	⊗	\vbipropto
∴	\ddotdotdot	⊸	\medvertdot	:	\vdotdot
∴	\diamondddots	⊖	\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 51: mathdesign Binary Operators

⊗ \dtimes × \udtimes × \utimes

The mathdesign package additionally provides versions of each of the binary operators shown in Table 45 on page 22.

TABLE 52: cml 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 53: shuffle Binary Operators

⊠ \cshuffle ⊢ \shuffle

TABLE 54: utsy Geometric Binary Operators

⊕ \odplus

TABLE 55: mathabx Geometric Binary Operators

▼	\blacktriangledown	□	\boxright	⊖	\ominus
◀	\blacktriangleleft	□	\boxslash	⊕	\oplus
▶	\blacktriangleright	□	\boxtimes	⊕	\right
▲	\blacktriangleup	□	\boxtop	⊖	\oslash
✳	\boxasterisk	□	\boxtriangleup	⊗	\otimes
▣	\boxbackslash	□	\boxvoid	⊕	\otop
▤	\boxbot	⊛	\oasterisk	△	\triangleup
▢	\boxcirc	⊗	\backslash	○	\void
✳	\boxcoasterisk	⊕	\obot	▽	\smalltriangledown
▢	\boxdiv	◎	\ocirc	◀	\smalltriangleleft
●	\boxdot	⊛	\ocoasterisk	▶	\smalltriangleright
▤	\boxleft	⊛	\odiv	▷	\smalltriangleup
▢	\boxminus	○	\odot	△	\smalltriangleup
▤	\boxplus	⊕	\oleft		

TABLE 56: 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	◎	\triangle
❖	\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	◎	\backslash	△	\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 57: Variable-sized Math Operators

∩	∩	\bigcap	⊗	⊗	\bigotimes	⊗	⊗	\bigotimes	∧	∧	\bigwedge	Π	Π	\prod
∪	∪	\bigcup	⊔	⊔	\bigsqcup	⊔	⊔	\bigsqcup	⊔	⊔	\coprod	Σ	Σ	\sum
⊙	⊙	\bigodot	⊕	⊕	\bigoplus	∫	∫	\int						
⊕	⊕	\bigoplus	∨	∨	\bigvee	ʃ	ʃ	\oint						

TABLE 58: *AMS* Variable-sized Math Operators

\iint	$\iint\iint$	$\iint\iint\iint$	\iiint	$\iiint\iiint$	$\iiint\iiint\iiint$
\iiiiint	$\iiiiint\iiiiint$	$\dots\int\int\dots\int$	$\dots\int\int\dots\int$	$\dots\int\int\dots\int$	$\dots\int\int\dots\int$

TABLE 59: *stmaryrd* Variable-sized Math Operators

$\square\square$	$\backslash bigbox$	$\parallel\parallel$	$\backslash biginterleave$	$\square\square$	$\backslash bigsqcap$
$\curlyvee\curlyvee$	$\backslash bigcurlyvee$	$\oplus\oplus$	$\backslash bignplus$	$\nabla\nabla$	$\backslash bigtriangledown$
$\curlywedge\curlywedge$	$\backslash bigcurlywedge$	$\parallel\parallel$	$\backslash bigparallel$	$\Delta\Delta$	$\backslash bigtriangleup$

TABLE 60: *wasysym* Variable-sized Math Operators

$\int\int$	$\backslash int^\dagger$	$\iint\iint$	$\iint\iint\iint$	$\iiiiint\iiiiint$	$\iiiiint\iiiiint\iiiiint$
$\int\int$	$\backslash varint^*$	$\oint\oint$	\varoint^*	$\oint\oint$	$\oint\oint$

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 L^AT_EX *\int* glyph (as shown in Table 57) is used.

TABLE 61: *mathabx* Variable-sized Math Operators

$\curlyvee\curlyvee$	$\backslash bigcurlyvee$	$\square\square$	$\backslash bigboxslash$	$\oplus\oplus$	$\backslash bigoright$
$\square\square$	$\backslash bigsqcap$	$\boxtimes\boxtimes$	$\backslash bigboxtimes$	$\oslash\oslash$	$\backslash bigoslash$
$\curlywedge\curlywedge$	$\backslash bigcurlywedge$	$\boxdot\boxdot$	$\backslash bigboxtop$	$\ominus\ominus$	$\backslash bigotop$
$\boxast\boxast$	$\backslash bigboxasterisk$	$\triangle\triangle$	$\backslash bigboxtriangleup$	$\odot\odot$	$\backslash bigotriangleup$

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$\square \blacksquare$	<code>\bigboxbackslash</code>	$\square \square$	<code>\bigboxvoid</code>	$\circ \circ$	<code>\bigovoid</code>
$\square \square$	<code>\bigboxbot</code>	$\complement \complement$	<code>\bigcomplementtop</code>	$++$	<code>\bigplus</code>
$\square \circ$	<code>\bigboxcirc</code>	$\circ \circ$	<code>\bigoasterisk</code>	$\sqcup \sqcup$	<code>\bigsquplus</code>
$\ast \ast$	<code>\bigboxcoasterisk</code>	$\otimes \otimes$	<code>\bigobackslash</code>	$\times \times$	<code>\bigtimes</code>
$\div \div$	<code>\bigboxdiv</code>	$\oplus \oplus$	<code>\bigobot</code>	$\iiint \iiint$	<code>\iiint</code>
$\bullet \bullet$	<code>\bigboxdot</code>	$\odot \odot$	<code>\bigocirc</code>	$\iint \iint$	<code>\iint</code>
$\square \square$	<code>\bigboxleft</code>	$\ast \ast$	<code>\bigocoasterisk</code>	$\int \int$	<code>\int</code>
$\square \square$	<code>\bigboxminus</code>	$\div \div$	<code>\bigodiv</code>	$\oint \oint$	<code>\oint</code>
$\square \square$	<code>\bigboxplus</code>	$\oplus \oplus$	<code>\bigoleft</code>	$\oint \oint$	<code>\oint</code>
$\square \square$	<code>\bigboxright</code>	$\ominus \ominus$			

TABLE 62: `txfonts/pxfonts` Variable-sized Math Operators

$\sqcup \sqcap$	<code>\bigsqcapplus</code>	$\oint \oint$	<code>\ointclockwise</code>
$\sqcup \sqcup$	<code>\bigsqcupplus</code>	$\oint \oint$	<code>\ointctr-clockwise</code>
$f \ f$	<code>\fint</code>	$\iiint \iiint$	<code>\sqiiint</code>
$\iint \iint$	<code>\idotsint</code>	$\oint \oint$	<code>\sqoint</code>
$\iiint \iiint$	<code>\iiint</code>	$\oint \oint$	<code>\sqoint</code>
$\iiint \iiint$	<code>\iiint</code>	$\iiint \iiint$	<code>\varoiintclockwise</code>

(continued on next page)

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\iint	\iiint	\iint	\iiint	$\text{\varoiintcclockwise}$
$\oint\oint$	$\oint\oint\oint$	\oiintclockwise	$\oint\oint$	$\text{\varoiintclockwise}$
$\oint\oint\oint$	$\oint\oint\oint\oint$	\oiintcclockwise	$\oint\oint$	$\text{\varoiintcclockwise}$
$\oint\oint\oint$	$\oint\oint\oint$	\oiint	$\oint\oint$	\varointclockwise
$\oint\oint$	$\oint\oint$	\oiintclockwise	$\oint\oint$	$\text{\varointcclockwise}$
$\oint\oint$	$\oint\oint\oint$	\oiintcclockwise	$\times \times$	\varprod
$\oint\oint$	$\oint\oint$	\oiint		

TABLE 63: esint Variable-sized Math Operators

$\dots\int$	$\int\dots\int$	\dotsint	\oint	\oint	\ointclockwise
f	f	\fint	\oint	\oint	\ointcclockwise
$\iint\iint$	$\iint\iint\iint$	\iiint	$\oint\oint$	$\oint\oint$	\sqint
$\iint\iint$	$\iint\iint\iint$	\iiint	\oint	\oint	\sqint
\iint	\iint	\iint	$\oint\oint$	$\oint\oint$	\varoiint
\oint	\oint	\landdownint	\oint	\oint	\varointclockwise
f	f	\landupint	\oint	\oint	$\text{\varointcclockwise}$
$\oint\oint$	$\oint\oint$	\oiint			

TABLE 64: MnSymbol Variable-sized Math Operators

\cap	\bigcap	$\backslash \bigcap$	\ominus	\bigominus	$\backslash \bigominus$	\complement	\bigcomplement	$\backslash \complement$
\capdot	\bigcapdot	$\backslash \bigcapdot$	\oplus	\bigoplus	$\backslash \bigoplus$	\coprod	\bigcoprod	$\backslash \coprod$
\capplus	\bigcapplus	$\backslash \bigcapplus$	\oslash	\bigoslash	$\backslash \bigoslash$	\idotsint	\bigidotsint	$\backslash \idotsint$
\circlearrowleft	\bigcirclearrowleft	$\backslash \bigcirclearrowleft$	\circledast	\bigcircledast	$\backslash \bigcircledast$	\iiint	\bigiiint	$\backslash \iiint$
\cup	\bigcup	$\backslash \bigcup$	\otimes	\bigotimes	$\backslash \bigotimes$	\iiint	\bigiiint	$\backslash \iiint$
\cupdot	\bigcupdot	$\backslash \bigcupdot$	\triangleleft	\bigtriangleleft	$\backslash \bigtriangleleft$	\iint	\bigiint	$\backslash \iint$
\cupplus *	\bigcupplus *	$\backslash \bigcupplus$ *	\circleddash	\bigcircleddash	$\backslash \bigcircleddash$	\int	\bigint	$\backslash \int$
\curlyvee	\bigcurlyvee	$\backslash \bigcurlyvee$	$+$	\bigplus	$\backslash \bigplus$	\landdownint	\biglanddownint	$\backslash \landdownint$
\curlyveedot	\bigcurlyveedot	$\backslash \bigcurlyveedot$	\sqcap	\bigsqcap	$\backslash \bigsqcap$	\landupint	\biglandupint	$\backslash \landupint$
\curlywedge	\bigcurlywedge	$\backslash \bigcurlywedge$	\sqcapdot	\bigsqcapdot	$\backslash \bigsqcapdot$	\lcircleleftint	\biglcircleleftint	$\backslash \lcircleleftint$
\curlywedgedot	\bigcurlywedgedot	$\backslash \bigcurlywedgedot$	\sqcapplus	\bigsqcapplus	$\backslash \bigsqcapplus$	\lcirclerightint	\biglcirclerightint	$\backslash \lcirclerightint$
\doublecurlyvee	\bigdoublecurlyvee	$\backslash \bigdoublecurlyvee$	\sqcup	\bigsqcup	$\backslash \bigsqcup$	\oiint	\bigoiint	$\backslash \oiint$
\doublecurlywedge	\bigdoublecurlywedge	$\backslash \bigdoublecurlywedge$	\sqcupdot	\bigsqcupdot	$\backslash \bigsqcupdot$	\oint	\bigoint	$\backslash \oint$
\doublevee	\bigdoublevee	$\backslash \bigdoublevee$	\sqcupplus	\bigsqcupplus	$\backslash \bigsqcupplus$	\prod	\bigprod	$\backslash \prod$
\doublewedge	\bigdoublewedge	$\backslash \bigdoublewedge$	\times	\bigtimes	$\backslash \bigtimes$	\rcircleleftint	\bigrcircleleftint	$\backslash \rcircleleftint$
\oast	\bigoast	$\backslash \bigoast$	\vee	\bigvee	$\backslash \bigvee$	\rcirclerightint	\bigrcirclerightint	$\backslash \rcirclerightint$
\backslash	\bigbackslash	$\backslash \bigbackslash$	\veeveedot	\bigveeveedot	$\backslash \bigveeveedot$	\strokedint	\bigstrokedint	$\backslash \strokedint$
\circlearrowright	\bigcirclearrowright	$\backslash \bigcirclearrowright$	\wedge	\bigwedge	$\backslash \bigwedge$	\sum	\bigsum	$\backslash \sum$
\odot	\bigodot	$\backslash \bigodot$	\wedgevegedot	\bigwedgevegedot	$\backslash \bigwedgevegedot$	\sumint	\bigsumint	$\backslash \sumint$

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

TABLE 65: `mathdesign` Variable-sized Math Operators

\int	\oint	<code>\intclockwise</code>	\oint	\ointclockwise
\iiint	\oiint	<code>\oiint</code>	\oint	\ointctrcclockwise
\oiint	\oint	<code>\oint</code>		

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

TABLE 66: `cml` Large Math Operators

$$\mathcal{D} \quad \backslash\bigparr \quad \& \quad \backslash\bigwith$$

TABLE 67: Binary Relations

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

* Not predefined in L^AT_EX 2_&. Use one of the packages `latexsym`, `amsfonts`, `amssymb`, `mathabx`, `txfonts`, `pxfonts`, or `wasysym`.

[†] The difference between `\mid` and `|` is that the former is a binary relation while the latter is a math ordinal. Consequently, L^AT_EX typesets the two with different surrounding spacing. Contrast “P(A | B)” \mapsto “ $P(A|B)$ ” with “P(A `\mid` B)” \mapsto “ $P(A | B)$ ”.

TABLE 68: `AMS` Binary Relations

\approx	<code>\approxeq</code>	$=$	<code>\eqcirc</code>	\approx	<code>\succapprox</code>
\backepsilon	<code>\backepsilon</code>	\doteq	<code>\fallingdotseq</code>	\succcurlyeq	<code>\succcurlyeq</code>
\backsim	<code>\backsim</code>	\multimap		\succsim	<code>\succsim</code>
\backsimeq	<code>\backsimeq</code>	\pitchfork	<code>\pitchfork</code>	\therefore	<code>\therefore</code>
\because	<code>\because</code>	\approx	<code>\approx</code>	\approx	<code>\thickapprox</code>
\between	<code>\between</code>	\precapprox	<code>\precapprox</code>	\sim	<code>\thicksim</code>
\Bumpeq	<code>\Bumpeq</code>	\precsim	<code>\precsim</code>	\propto	<code>\varpropto</code>
\bumpeq	<code>\bumpeq</code>	\risingdotseq	<code>\risingdotseq</code>	\Vdash	<code>\Vdash</code>
\circeq	<code>\circeq</code>	\shortmid	<code>\shortmid</code>	\vDash	<code>\vDash</code>
\curlyeqsucc	<code>\curlyeqsucc</code>	\shortparallel	<code>\shortparallel</code>	\VvDash	<code>\VvDash</code>
\doteqdot	<code>\doteqdot</code>	\smallfrown	<code>\smallfrown</code>		
		\smallsmile	<code>\smallsmile</code>		

TABLE 69: *AMS* Negated Binary Relations

$\not\equiv$	<code>\ncong</code>	$\not\vdash$	<code>\nshortparallel</code>	$\not\models$	<code>\nVdash</code>
$\not\models$	<code>\nmid</code>	$\not\sim$	<code>\nsim</code>	$\not\approx$	<code>\precnapprox</code>
$\not\parallel$	<code>\nparallel</code>	$\not\succ$	<code>\nsucc</code>	$\not\asymp$	<code>\precnsim</code>
$\not\prec$	<code>\nprec</code>	$\not\asymp$	<code>\nsucc\eqq</code>	$\not\asymp$	<code>\succnapprox</code>
$\not\preceq$	<code>\npreceq</code>	$\not\models$	<code>\nvDash</code>	$\not\asymp$	<code>\succnsim</code>
$\not\models$	<code>\nshortmid</code>	$\not\models$	<code>\nvdash</code>	$\not\asymp$	<code>\succnsim</code>

TABLE 70: *stmaryrd* Binary Relations

$$\in \quad \backslash\inplus \quad \ni \quad \backslash\niplus$$

TABLE 71: *wasy sym* Binary Relations

\vdash	<code>\invneg</code>	\rightsquigarrow	<code>\leadsto</code>	\propto	<code>\wasypromo</code>
\bowtie	<code>\Join</code>	\oplus	<code>\logof</code>		

TABLE 72: *txfonts/pf fonts* Binary Relations

\oslash	<code>\circledgtr</code>	\bowtie	<code>\lJoin</code>	\times	<code>\opentimes</code>
\oslash	<code>\circledless</code>	\bowtie	<code>\lRtimes</code>	$\perp\!\!\!\perp$	<code>\Perp</code>
\approx	<code>\colonapprox</code>	\multimap	<code>\multimap</code>	\asymp	<code>\preceqq</code>
$\approx\approx$	<code>\Colonapprox</code>	\multimapboth	<code>\multimapboth</code>	$\not\asymp$	<code>\precneqq</code>
$\vdash\vdash$	<code>\coloneq</code>	\multimapbothvert	<code>\multimapbothvert</code>	\bowtie	<code>\rJoin</code>
$\vdash\vdash$	<code>\Coloneq</code>	\multimapdot	<code>\multimapdot</code>	\sqsubset	<code>\strictfi</code>
$\vdash\vdash$	<code>\Coloneqq</code>	\multimapdotboth	<code>\multimapdotboth</code>	\exists	<code>\strictif</code>
$\vdash\vdash$	<code>\coloneqq^*</code>	\multimapdotbothA	<code>\multimapdotbothA</code>	$\exists\exists$	<code>\strictiff</code>
$\vdash\vdash$	<code>\Colonsim</code>	\multimapdotbothAvert	<code>\multimapdotbothAvert</code>	\asymp	<code>\succeqq</code>
$\vdash\vdash$	<code>\colonsim</code>	\multimapdotbothB	<code>\multimapdotbothB</code>	$\not\asymp$	<code>\succneqq</code>
$\vdash\vdash$	<code>\Eqcolon</code>	\multimapdotbothBvert	<code>\multimapdotbothBvert</code>	\parallel	<code>\varparallel</code>
$\vdash\vdash$	<code>\eqcolon</code>	\multimapdotbothvert	<code>\multimapdotbothvert</code>	$\parallel\!\!\!\parallel$	<code>\varparallelinv</code>
$\vdash\vdash$	<code>\eqqcolon</code>	\multimapdotinv	<code>\multimapdotinv</code>	$\not\parallel$	<code>\VvDash</code>
$\vdash\vdash$	<code>\Eqqcolon</code>	\multimapinv	<code>\multimapinv</code>		
$\vdash\vdash$	<code>\eqsim</code>	\times	<code>\openJoin</code>		

* As an alternative to using *txfonts/pf fonts*, a “:=” symbol can be constructed with “`\mathrel{\mathop:}=`”.

TABLE 73: *txfonts/pf fonts* Negated Binary Relations

$\not\equiv$	<code>\napproxeq</code>	$\not\equiv$	<code>\preccurlyeq</code>	$\not\equiv$	<code>\nthickapprox</code>
$\not\equiv$	<code>\nasmp</code>	$\not\equiv$	<code>\preceqq</code>	$\not\Leftarrow$	<code>\ntwoheadleftarrow</code>
$\not\equiv$	<code>\backsim</code>	$\not\equiv$	<code>\precsim</code>	$\not\Rightarrow$	<code>\ntwoheadrightarrow</code>
$\not\equiv$	<code>\backsim\eqq</code>	$\not\equiv$	<code>\simeq</code>	$\not\parallel$	<code>\nvarparallel</code>
$\not\equiv$	<code>\bumpeq</code>	$\not\equiv$	<code>\succapprox</code>	$\not\parallel$	<code>\nvarparallelinv</code>
$\not\equiv$	<code>\Bumpeq</code>	$\not\equiv$	<code>\succcurlyeq</code>	$\not\models$	<code>\nDash</code>
$\not\equiv$	<code>\nequiv</code>	$\not\equiv$	<code>\succeqq</code>		
$\not\equiv$	<code>\precapprox</code>	$\not\equiv$	<code>\succcsim</code>		

TABLE 74: *mathabx* Binary Relations

\between	<code>\between</code>	\mid	<code>\divides</code>	\doteqdot	<code>\risingdotseq</code>
\botdoteq	<code>\botdoteq</code>	\dotdoteq	<code>\dotseq</code>	\succapprox	<code>\succapprox</code>
\Bumpedeq	<code>\Bumpedeq</code>	\eqbumped	<code>\eqbumped</code>	\succcurlyeq	<code>\succcurlyeq</code>
\bumpedeq	<code>\bumpedeq</code>	\eqcirc	<code>\eqcirc</code>	\succdot	<code>\succdot</code>
\circeq	<code>\circeq</code>	\eqcolon	<code>\eqcolon</code>	\succsim	<code>\succsim</code>
\coloneq	<code>\coloneq</code>	\fallingdotseq	<code>\fallingdotseq</code>	\therefore	<code>\therefore</code>
\corresponds	<code>\corresponds</code>	\ggcurly	<code>\ggcurly</code>	\topdoteq	<code>\topdoteq</code>
\curlyeqprec	<code>\curlyeqprec</code>	\llcurly	<code>\llcurly</code>	\vDash	<code>\vDash</code>
\curlyeqsucc	<code>\curlyeqsucc</code>	\precapprox	<code>\precapprox</code>	\Vdash	<code>\Vdash</code>
\DashV	<code>\DashV</code>	\preccurlyeq	<code>\preccurlyeq</code>	\VDash	<code>\VDash</code>
\Dashv	<code>\Dashv</code>	\precdot	<code>\precdot</code>	\Vvdash	<code>\Vvdash</code>
\dashVv	<code>\dashVv</code>	\precsim	<code>\precsim</code>		

TABLE 75: *mathabx* Negated Binary Relations

$\not\approx$	<code>\napprox</code>	$\not\doteq$	<code>\notperp</code>	$\not\doteqdot$	<code>\nvDash</code>
$\not\cong$	<code>\ncong</code>	$\not\doteqdot$	<code>\npref</code>	$\not\doteqdot$	<code>\nVDash</code>
$\not\curlyeqprec$	<code>\ncurlyeqprec</code>	$\not\approxdot$	<code>\nprefapprox</code>	$\not\approxdot$	<code>\nVdash</code>
$\not\curlyeqsucc$	<code>\curlyeqsucc</code>	$\not\approxdot$	<code>\preccurlyeq</code>	$\not\approxdot$	<code>\nvDash</code>
$\not\Dashv$	<code>\Dashv</code>	$\not\doteqdot$	<code>\preceq</code>	$\not\doteqdot$	<code>\nVash</code>
$\not\DashV$	<code>\DashV</code>	$\not\doteqdot$	<code>\precsim</code>	$\not\approxdot$	<code>\precnaprox</code>
$\not\Dashh$	<code>\Dashh</code>	$\not\doteqdot$	<code>\nsim</code>	$\not\approxdot$	<code>\precneq</code>
$\not\DashhV$	<code>\DashhV</code>	$\not\doteqdot$	<code>\nsimeq</code>	$\not\approxdot$	<code>\precnsim</code>
$\not\Dashhv$	<code>\Dashhv</code>	$\not\doteqdot$	<code>\nsucc</code>	$\not\approxdot$	<code>\succnaprox</code>
$\not\neq$	<code>\neq</code>	$\not\doteqdot$	<code>\nsuccapprox</code>	$\not\approxdot$	<code>\succneq</code>
$\not\asymp$	<code>\notasymp</code>	$\not\doteqdot$	<code>\succcurlyeq</code>	$\not\approxdot$	<code>\succnsim</code>
$\not\divides$	<code>\notdivides</code>	$\not\doteqdot$	<code>\succeq</code>		
$\not\equiv$	<code>\notequiv</code>	$\not\doteqdot$	<code>\succcsim</code>		

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 “ $a \not= b$ ”.

TABLE 76: *MnSymbol* Binary Relations

\approx	<code>\approx</code>	\eqbump	\wedge	<code>\nwfootline</code>	\nwarrow	<code>\seVdash</code>
$\approx \approx$	<code>\approxeq</code>	\eqcirc	\wedge	<code>\nwfree</code>	\parallel	<code>\shortparallel</code>
$\approx \approx$	<code>\backapprox</code>	\eqdot	\vee	<code>\nwmodels</code>	\sim	<code>\sim</code>
$\approx \approx$	<code>\backapproxeq</code>	\eqsim	\vee	<code>\nwModels</code>	\simeq	<code>\simeq</code>
$\approx \approx$	<code>\backcong</code>	\equal	$+$	<code>\nwsecrossing</code>	$>$	<code>\succ</code>
$\approx \approx$	<code>\backeqsim</code>	\equalclosed	\backslash	<code>\nwsepline</code>	\approx	<code>\succapprox</code>
$\approx \approx$	<code>\backsim</code>	\equiv	\equiv	<code>\Nwsepline</code>	\approx	<code>\succcurlyeq</code>
$\approx \approx$	<code>\backsimeq</code>	\equivclosed	$>$	<code>\nwvdash</code>	\geq	<code>\succeq</code>
$\approx \approx$	<code>\backtriplesim</code>	\fallingdotseq	\vee	<code>\nwVdash</code>	\geq	<code>\succsim</code>
$\approx \approx$	<code>\between</code>	\hateq	$<$	<code>\prec</code>	\checkmark	<code>\swfootline</code>

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\trianglelefteq	$\backslash bumpeq$	\times	$\backslash hcrossing$	\approx	$\backslash precapprox$	\swarrow	$\backslash swfree$
\trianglerighteq	$\backslash Bumpeq$	\vdash	$\backslash leftfootline$	\asymp	$\backslash preccurlyeq$	\nwarrow	$\backslash swmodels$
\circlearrowleft	$\backslash circeq$	\leftarrow	$\backslash leftfree$	\leq	$\backslash preceq$	\nearrow	$\backslash swModels$
\sqsubseteq	$\backslash closedequal$	\sqsupseteq	$\backslash leftmodels$	\gtrsim	$\backslash precsim$	\nearrow	$\backslash swdash$
\triangleleft	$\backslash closedprec$	\nparallel	$\backslash leftModels$	\vdash	$\backslash rightfootline$	\nwarrow	$\backslash swVdash$
\triangleright	$\backslash closedsucc$	\propto	$\backslash leftproto$	\rightarrow	$\backslash rightfree$	\approx	$\backslash triplesim$
\coloneqq	$\backslash coloneq$	$-$	$\backslash leftrightline$	\vDash	$\backslash rightmodels$	$ $	$\backslash updownline$
\cong	$\backslash cong$	$=$	$\backslash Leftrightline$	\Vdash	$\backslash rightModels$	\parallel	$\backslash Updownline$
\curlyeqsucc	$\backslash curlyeqprec$	\triangleleft	$\backslash leftslice$	\bowtie	$\backslash rightproto$	\top	$\backslash upfootline$
\curlyeqsucc	$\backslash curlyeqsucc$	\dashv	$\backslash leftvdash$	\triangleright	$\backslash rightslice$	\uparrow	$\backslash upfree$
\doteq	$\backslash doteq$	\nparallel	$\backslash leftVdash$	\vdash	$\backslash rightvdash$	\nparallel	$\backslash upmodels$
\div	$\backslash Doteq$	\nearrow	$\backslash nefootline$	\Vdash	$\backslash rightVdash$	\nparallel	$\backslash upModels$
\downarrow	$\backslash downfootline$	\wedge	$\backslash nefree$	\doteq	$\backslash risingdotseq$	\otimes	$\backslash upproto$
\downarrow	$\backslash downfree$	\triangleleft	$\backslash nemodels$	\vee	$\backslash sefootline$	\perp	$\backslash upvdash$
\Downarrow	$\backslash downmodels$	\triangleleft	$\backslash neModels$	\vee	$\backslash sefree$	\perp	$\backslash upVdash$
\Downarrow	$\backslash downModels$	$/$	$\backslash neswline$	\triangleleft	$\backslash semodels$	\times	$\backslash vcrossing$
\Downarrow	$\backslash downproto$	\nparallel	$\backslash Neswline$	\triangleleft	$\backslash seModels$	\nparallel	$\backslash Vvdash$
\Downarrow	$\backslash downvdash$	\swarrow	$\backslash nevdash$	\circ	$\backslash separated$		
\Downarrow	$\backslash downVdash$	\triangleleft	$\backslash neVdash$	\wedge	$\backslash sevdash$		

MnSymbol additionally defines synonyms for some of the preceding symbols:

\dashv	$\backslash dashv$	(same as $\backslash leftvdash$)
\diagdown	$\backslash diagdown$	(same as $\backslash nwseline$)
\diagup	$\backslash diagup$	(same as $\backslash neswline$)
\div	$\backslash divides$	(same as $\backslash updownline$)
\doteqdot	$\backslash doteqdot$	(same as $\backslash Doteq$)
\models	$\backslash models$	(same as $\backslash rightmodels$)
\parallel	$\backslash parallel$	(same as $\backslash Updownline$)
\perp	$\backslash perp$	(same as $\backslash upvdash$)
\propto	$\backslash proto$	(same as $\backslash leftproto$)
\relbar	$\backslash relbar$	(same as $\backslash leftrightline$)
$=$	$\backslash Relbar$	(same as $\backslash Leftrightline$)
\varpropto	$\backslash varproto$	(same as $\backslash leftproto$)
\vDash	$\backslash vDash$	(same as $\backslash rightmodels$)
\Vdash	$\backslash VDash$	(same as $\backslash rightModels$)
\vdash	$\backslash vdash$	(same as $\backslash rightvdash$)
\Vdash	$\backslash Vdash$	(same as $\backslash rightVdash$)

TABLE 77: MnSymbol Negated Binary Relations

$\not\approx$	$\backslash napprox$	$\not\equiv$	$\backslash neqsim$	$\not\approx$	$\backslash nnwModels$	$\not\approx$	$\backslash nsucc$
$\not\approx$	$\backslash napproxeq$	\neq	$\backslash equal$	\times	$\backslash nnwsepline$	$\not\approx$	$\backslash nsuccapprox$
$\not\approx$	$\backslash nbackapprox$	$\not\equiv$	$\backslash nequalclosed$	$\not\approx$	$\backslash nNwsepline$	$\not\approx$	$\backslash nsucccurlyeq$
$\not\approx$	$\backslash nbackapproxeq$	\neq	$\backslash nequiv$	$\not\approx$	$\backslash nnwvdash$	$\not\approx$	$\backslash nsucceq$
$\not\approx$	$\backslash nbackcong$	$\not\equiv$	$\backslash nequivclosed$	$\not\approx$	$\backslash nnwVdash$	$\not\approx$	$\backslash nsuccsim$
$\not\approx$	$\backslash nbackeqsim$	$\not\equiv$	$\backslash neswcrossing$	$\not\approx$	$\backslash nprec$	$\not\approx$	$\backslash nswfootline$
$\not\approx$	$\backslash nbacksim$	$\not\equiv$	$\backslash nfallingdotseq$	$\not\approx$	$\backslash nprecapprox$	$\not\approx$	$\backslash nswfree$

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$\not\equiv$	<code>\nbacksimeq</code>	$\not\equiv$	<code>\nhateq</code>	$\not\equiv$	<code>\npreccurlyeq</code>	$\not\asymp$	<code>\nswmodels</code>
$\not\asymp$	<code>\nbacktriplesim</code>	$\not\vdash$	<code>\nleftfootline</code>	$\not\preceq$	<code>\npreceq</code>	$\not\asymp$	<code>\nswModels</code>
$\not\vdash$	<code>\nbumppeq</code>	$\not\leftarrow$	<code>\nleftfree</code>	$\not\precsim$	<code>\nprecsim</code>	$\not\asymp$	<code>\nswVdash</code>
$\not\vdash$	<code>\nBumpeq</code>	$\not\#$	<code>\nleftmodels</code>	$\not\vdash$	<code>\nrightfootline</code>	$\not\asymp$	<code>\nswVdash</code>
$\not\vdash$	<code>\ncirceq</code>	$\not\#l$	<code>\nleftModels</code>	$\not\vdash$	<code>\nrightfree</code>	$\not\asymp$	<code>\ntriplesim</code>
$\not\vdash$	<code>\nclosedeql</code>	$\not+$	<code>\nleftrightline</code>	$\not\#$	<code>\nrightmodels</code>	$\not\vdash$	<code>\nupdownline</code>
$\not\vdash$	<code>\ncong</code>	$\not\neq$	<code>\nLeftrightline</code>	$\not\#l\#$	<code>\nrightModels</code>	$\not\vdash$	<code>\nUpdownline</code>
$\not\asymp$	<code>\ncurlyeqprec</code>	$\not\vdash$	<code>\nleftvdash</code>	$\not\vdash$	<code>\nrightvdash</code>	$\not\vdash$	<code>\nupfootline</code>
$\not\asymp$	<code>\ncurlyeqsucc</code>	$\not\#l$	<code>\nleftVdash</code>	$\not\#l\#$	<code>\nrightVdash</code>	$\not\vdash$	<code>\nupfree</code>
$\not\vdash$	<code>\ndoteq</code>	$\not\times$	<code>\nnefootline</code>	$\not\#$	<code>\nrisingdotseq</code>	$\not\#$	<code>\nupmodels</code>
$\not\vdash$	<code>\nDoteq</code>	$\not\times$	<code>\nnefree</code>	$\not\times$	<code>\nsefootline</code>	$\not\#$	<code>\nupModels</code>
$\not\vdash$	<code>\ndownfootline</code>	$\not\asymp$	<code>\nnemodels</code>	$\not\times$	<code>\nsefree</code>	$\not\vdash$	<code>\nupVdash</code>
$\not\vdash$	<code>\downfootline</code>	$\not\asymp$	<code>\nneModels</code>	$\not\asymp$	<code>\nsemodels</code>	$\not\vdash$	<code>\nupVdash</code>
$\not\vdash$	<code>\ndownmodels</code>	$\not\times$	<code>\nneswline</code>	$\not\asymp$	<code>\nseModels</code>	$\not\asymp$	<code>\precnapprox</code>
$\not\vdash$	<code>\downmodels</code>	$\not\asymp$	<code>\nNeswline</code>	$\not\times$	<code>\nsevdash</code>	$\not\asymp$	<code>\precnsim</code>
$\not\vdash$	<code>\ndownvdash</code>	$\not\asymp$	<code>\nnevDash</code>	$\not\asymp$	<code>\nseVdash</code>	$\not\asymp$	<code>\succcnapprox</code>
$\not\vdash$	<code>\downVdash</code>	$\not\asymp$	<code>\nneVdash</code>	$\not\times$	<code>\nshortmid</code>	$\not\asymp$	<code>\succcnsim</code>
$\not\vdash$	<code>\neqbump</code>	$\not\times$	<code>\nnwfootline</code>	$\not\#$	<code>\nshortparallel</code>		
$\not\vdash$	<code>\neqcirc</code>	$\not\times$	<code>\nnwfree</code>	$\not\times$	<code>\nsim</code>		
$\not\vdash$	<code>\neqdot</code>	$\not\asymp$	<code>\nnwmodels</code>	$\not\#$	<code>\nsimeq</code>		

MnSymbol additionally defines synonyms for some of the preceding symbols:

$\not\vdash$	<code>\ndashv</code>	(same as <code>\nleftvdash</code>)
$\not\times$	<code>\ndiagdown</code>	(same as <code>\nnwsepline</code>)
$\not\times$	<code>\ndiagup</code>	(same as <code>\nneswline</code>)
$\not\vdash$	<code>\ndivides</code>	(same as <code>\nupdownline</code>)
$\not\vdash$	<code>\ne</code>	(same as <code>\nequal</code>)
$\not\vdash$	<code>\neq</code>	(same as <code>\nequal</code>)
$\not\vdash$	<code>\nmid</code>	(same as <code>\nupdownline</code>)
$\not\vdash$	<code>\nmodels</code>	(same as <code>\nrightmodels</code>)
$\not\vdash$	<code>\nparallel</code>	(same as <code>\nUpdownline</code>)
$\not\vdash$	<code>\nperp</code>	(same as <code>\nupVdash</code>)
$\not\vdash$	<code>\nrelbar</code>	(same as <code>\nleftrightline</code>)
$\not\vdash$	<code>\nRelbar</code>	(same as <code>\nLeftrightline</code>)
$\not\vdash$	<code>\nvDash</code>	(same as <code>\nrightmodels</code>)
$\not\vdash$	<code>\nvDash</code>	(same as <code>\nrightvdash</code>)
$\not\#l\#$	<code>\nVdash</code>	(same as <code>\nrightVdash</code>)
$\not\#l\#$	<code>\nVDash</code>	(same as <code>\nrightModels</code>)

TABLE 78: mathtools Binary Relations

$\approx\approx$	<code>\Colonapprox</code>	$\vdash\vdash$	<code>\coloneq</code>	$\dashv\dashv$	<code>\Eqcolon</code>
$\approx\approx$	<code>\colonapprox</code>	$\sim\sim$	<code>\colonsim</code>	$=:=$	<code>\eqqcolon</code>
$\vdash\vdash$	<code>\coloneqq</code>	$\approx\approx$	<code>\Colonsim</code>	$\dashv\dashv$	<code>\Eqqcolon</code>
$\approx\approx$	<code>\Coloneqq</code>	$\vdash\vdash$	<code>\dblcolon</code>		
$\vdash\vdash$	<code>\Coloneq</code>	$\dashv\dashv$	<code>\eqcolon</code>		

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

$$\text{=:} \quad \text{vs.} \quad \text{=:} \\ \text{``=:''} \quad \text{``=:''}$$

TABLE 79: turnstile Binary Relations

$\frac{def}{abc}$	<code>\dddtstile{abc}{def}</code>	$\frac{def}{abc}$	<code>\nntstile{abc}{def}</code>	$\frac{def}{abc}$	<code>\stdtstile{abc}{def}</code>
$\frac{def}{abc}$	<code>\ddststile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\nnttstile{abc}{def}</code>	$\frac{def}{abc}$	<code>\stststile{abc}{def}</code>
$\frac{def}{abc}$	<code>\ddtstile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\nsdtstile{abc}{def}</code>	$\frac{def}{abc}$	<code>\sttstile{abc}{def}</code>
$\frac{def}{abc} \parallel$	<code>\ddttstile{abc}{def}</code>	$\frac{def}{abc}$	<code>\nsststile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\stttstile{abc}{def}</code>
$\frac{def}{abc} \parallel$	<code>\dnntstile{abc}{def}</code>	$\frac{def}{abc}$	<code>\nststile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\tddtstile{abc}{def}</code>
$\frac{def}{abc}$	<code>\dnststile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\nstattstile{abc}{def}</code>	$\frac{def}{abc}$	<code>\tdststile{abc}{def}</code>
$\frac{def}{abc}$	<code>\dntstile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\ntdtstile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\tdtstile{abc}{def}</code>
$\frac{def}{abc} \parallel$	<code>\dnnttstile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\ntststile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\tdtttstile{abc}{def}</code>
$\frac{def}{abc} \parallel$	<code>\dsdtstile{abc}{def}</code>	$\frac{def}{abc}$	<code>\nttstile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\tndtstile{abc}{def}</code>
$\frac{def}{abc}$	<code>\dsststile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\ntttstile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\tnststile{abc}{def}</code>
$\frac{def}{abc}$	<code>\dststile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\sddtstile{abc}{def}</code>	$\frac{def}{abc}$	<code>\tnntstile{abc}{def}</code>
$\frac{def}{abc} \parallel$	<code>\dstattstile{abc}{def}</code>	$\frac{def}{abc}$	<code>\sdststile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\tnnttstile{abc}{def}</code>
$\frac{def}{abc}$	<code>\dtdtstile{abc}{def}</code>	$\frac{def}{abc}$	<code>\sdtstile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\tsdtstile{abc}{def}</code>
$\frac{def}{abc}$	<code>\dtststile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\sdttstile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\tsststile{abc}{def}</code>
$\frac{def}{abc}$	<code>\dttstile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\sndtstile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\tststile{abc}{def}</code>
$\frac{def}{abc} \parallel$	<code>\dtttstile{abc}{def}</code>	$\frac{def}{abc}$	<code>\snststile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\tsttstile{abc}{def}</code>
$\frac{def}{abc} \parallel$	<code>\nddtstile{abc}{def}</code>	$\frac{def}{abc}$	<code>\sntstile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\ttdtstile{abc}{def}</code>
$\frac{def}{abc}$	<code>\ndststile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\snttstile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\ttststile{abc}{def}</code>
$\frac{def}{abc}$	<code>\ndtstile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\ssdtstile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\tttstile{abc}{def}</code>
$\frac{def}{abc} \parallel$	<code>\ndttstile{abc}{def}</code>	$\frac{def}{abc}$	<code>\ssststile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\ttttstile{abc}{def}</code>
$\frac{def}{abc} \parallel$	<code>\nnntstile{abc}{def}</code>	$\frac{def}{abc}$	<code>\sststile{abc}{def}</code>		
$\frac{def}{abc}$	<code>\nnststile{abc}{def}</code>	$\frac{def}{abc} \parallel$	<code>\ssttstile{abc}{def}</code>		

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 80: `trsym` Binary Relations

$\bullet\circ$	<code>\InversTransformHoriz</code>	$\circ\bullet$	<code>\TransformHoriz</code>
\bullet	<code>\InversTransformVert</code>	\bullet	<code>\TransformVert</code>

TABLE 81: `trfsigns` Binary Relations

$\circ\swarrow$	<code>\dfourier</code>	$\nwarrow\circ$	<code>\Dfourier</code>
$\circ\mid$	<code>\fourier</code>	$\mid\circ$	<code>\Fourier</code>
$\circ\bullet$	<code>\laplace</code>	$\bullet\circ$	<code>\Laplace</code>
$\circ\swarrow\bullet$	<code>\ztransf</code>	$\bullet\searrow\circ$	<code>\Ztransf</code>

TABLE 82: `cml` Binary Relations

\subset	<code>\coh</code>	\supset	<code>\scoh</code>
\asymp	<code>\incoh</code>	\asymp	<code>\sincoh</code>

TABLE 83: `colonequals` Binary Relations

$\approx:$	<code>\approxcolon</code>	$::-$	<code>\coloncolonminus</code>	$=::$	<code>\equalscoloncolon</code>
$\approx::$	<code>\approxcoloncolon</code>	$::\sim$	<code>\coloncolon\sim</code>	$-:$	<code>\minuscolon</code>
$\approx:$	<code>\colonapprox</code>	$::=$	<code>\colonequals</code>	$-::$	<code>\minuscoloncolon</code>
$::$	<code>\coloncolon</code>	$::-$	<code>\colonminus</code>	$:$	<code>\ratio</code>
$::\approx$	<code>\coloncolonapprox</code>	$\sim::$	<code>\colon\sim</code>	$\sim::$	<code>\simcolon</code>
$::=:$	<code>\coloncolon\colonequals</code>	$=::$	<code>\equalscolon</code>	$\sim:::$	<code>\simcoloncolon</code>

TABLE 84: `fourier` Binary Relations

#	<code>\nparallelslant</code>	//	<code>\parallelslant</code>
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TABLE 85: Subset and Superset Relations

\sqsubset	<code>\sqsubset</code>	\sqsupseteq	<code>\sqsupseteq</code>	\supset	<code>\supset</code>
\sqsubseteq	<code>\sqsubseteq</code>	\subset	<code>\subset</code>	\supseteq	<code>\supseteq</code>
\sqsupset	<code>\sqsupset</code>	\sqsubseteq	<code>\sqsubseteq</code>	\supseteq	<code>\supseteq</code>

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

TABLE 86: `AMS` Subset and Superset Relations

$\not\sqsubset$	<code>\nsqsubset</code>	\sqsubseteq	<code>\subsetneqq</code>	\supset	<code>\supsetneqq</code>
$\not\sqsupseteq$	<code>\nsupseteq</code>	\sqsupseteq	<code>\subsetneq</code>	\supseteq	<code>\supsetneq</code>
$\not\sqsupset$	<code>\nsupset</code>	\sqsupseteq	<code>\subsetneq</code>	\supseteq	<code>\supsetneq</code>
\sqsubset	<code>\sqsubset</code>	\supset	<code>\Supset</code>	$\not\sqsupset$	<code>\varsupsetneq</code>
\sqsupset	<code>\sqsupset</code>	\supsetneqq	<code>\supseteqeq</code>	$\not\sqsupsetneq$	<code>\varsupsetneqq</code>
\Subset	<code>\Subset</code>	\supsetneq	<code>\supsetneqq</code>	$\not\sqsupsetneq$	<code>\varsupsetneqq</code>

TABLE 87: *stmaryrd* Subset and Superset Relations

\Subset	<code>\subsetplus</code>	\Supset	<code>\supsetplus</code>
\Subseteq	<code>\subsetplusseq</code>	\Supseteq	<code>\supsetplusseq</code>

TABLE 88: *wasy sym* Subset and Superset Relations

\sqsubset	<code>\sqsubset</code>	\sqsupset	<code>\sqsupset</code>
-------------	------------------------	-------------	------------------------

TABLE 89: *txfonts/pxfonts* Subset and Superset Relations

\nsubseteq	<code>\nsqsubset</code>	\nsubseteqq	<code>\nsqsubseteq</code>	\nexists	<code>\nexistsupset</code>
\nsubseteqq	<code>\nsqsubseteq</code>	\nsubseteqq	<code>\nsqsubseteqq</code>	\nexists	<code>\nexistsupseteq</code>
\nexists	<code>\nsqsubset</code>	\nexists	<code>\nsqsubseteqq</code>	\nexists	<code>\nexistsupseteqq</code>

TABLE 90: *mathabx* Subset and Superset Relations

\nsubseteq	<code>\nsqsubset</code>	\nsubseteqq	<code>\nsqsubseteq</code>	\nexists	<code>\nsqsubsetneq</code>
\nsubseteqq	<code>\nsqsubseteq</code>	\nsubseteqq	<code>\nsqsubsetneqq</code>	\nexists	<code>\nsqsubsetneqq</code>
\nexists	<code>\nsqsubset</code>	\nexists	<code>\nsqsubsetneqq</code>	\nexists	<code>\nsqsubsetneqq</code>
\nsubseteq	<code>\nsqsupset</code>	\nsubseteqq	<code>\nsqsupseteq</code>	\nexists	<code>\nsqsupsetneq</code>
\nsubseteqq	<code>\nsqsupseteq</code>	\nsubseteqq	<code>\nsqsupseteqq</code>	\nexists	<code>\nsqsupsetneqq</code>
\nexists	<code>\nsqsupset</code>	\nexists	<code>\nsqsupseteqq</code>	\nexists	<code>\nsqsupsetneqq</code>
\nsubseteq	<code>\nsqsupseteq</code>	\nsubseteqq	<code>\nsqsupseteqq</code>	\nexists	<code>\nsqsupsetneq</code>
\nsubseteqq	<code>\nsqsupseteqq</code>	\nsubseteqq	<code>\nsqsupsetneqq</code>	\nexists	<code>\nsqsupsetneqq</code>
\nexists	<code>\nsqsupseteqq</code>	\nexists	<code>\nsqsupsetneqq</code>	\nexists	<code>\nsqsupsetneqq</code>
\nsubseteq	<code>\nsupset</code>	\nsubseteqq	<code>\nsupseteq</code>	\nexists	<code>\nsupsetneq</code>
\nsubseteqq	<code>\nsupseteq</code>	\nsubseteqq	<code>\nsupseteqq</code>	\nexists	<code>\nsupsetneqq</code>
\nexists	<code>\nsupset</code>	\nexists	<code>\nsupseteqq</code>	\nexists	<code>\nsupsetneqq</code>
\nsubseteq	<code>\nsupseteq</code>	\nsubseteqq	<code>\nsupseteqq</code>	\nexists	<code>\nsupsetneq</code>
\nsubseteqq	<code>\nsupseteqq</code>	\nsubseteqq	<code>\nsupsetneqq</code>	\nexists	<code>\nsupsetneqq</code>
\nexists	<code>\nsupseteqq</code>	\nexists	<code>\nsupsetneqq</code>	\nexists	<code>\nsupsetneqq</code>

TABLE 91: *MnSymbol* Subset and Superset Relations

\nsubseteq	<code>\nSqsubset</code>	\nsubseteqq	<code>\nsubseteq</code>	\nexists	<code>\nsqsubsetneq</code>
\nsubseteqq	<code>\nSqsubset</code>	\nsubseteqq	<code>\nsubseteqq</code>	\nexists	<code>\nsqsubsetneqq</code>
\nexists	<code>\nSqsubseteq</code>	\nexists	<code>\nSupset</code>	\nexists	<code>\Sqsupset</code>
\nexists	<code>\nSqsubseteqq</code>	\nexists	<code>\nSupset</code>	\nexists	<code>\nsqsupset</code>
\nexists	<code>\nSqsupset</code>	\nexists	<code>\nSupseteq</code>	\nexists	<code>\nsqsupseteq</code>
\nexists	<code>\nSqsupset</code>	\nexists	<code>\nSupseteqq</code>	\nexists	<code>\nsqsupseteqq</code>
\nexists	<code>\nSqsupseteq</code>	\nexists	<code>\nSupset</code>	\nexists	<code>\Sqsupset</code>
\nexists	<code>\nSqsupseteqq</code>	\nexists	<code>\nSupset</code>	\nexists	<code>\nsqsupset</code>
\nexists	<code>\nSqsupseteqq</code>	\nexists	<code>\nSupseteq</code>	\nexists	<code>\nsqsupseteq</code>
\nexists	<code>\nSqsupseteqq</code>	\nexists	<code>\nSupseteqq</code>	\nexists	<code>\nsqsupseteqq</code>
\nexists	<code>\nSubset</code>	\nexists	<code>\nSubseteq</code>	\nexists	<code>\Subset</code>
\nexists	<code>\nSubset</code>	\nexists	<code>\nSubseteqq</code>	\nexists	<code>\Subseteq</code>
\nexists	<code>\nSubset</code>	\nexists	<code>\nsubset</code>	\nexists	<code>\nsqsubset</code>

MnSymbol additionally defines `\varsqsubsetneq` as a synonym for `\subsetneq`, `\varsqsubsetneqq` as a synonym for `\subsetneqq`, `\varsupsetneq` as a synonym for `\supsetneq`, and `\varsupsetneqq` as a synonym for `\supsetneqq`.

TABLE 92: Inequalities

\geq	<code>\geq</code>	\gg	<code>\gg</code>	\leq	<code>\leq</code>	\ll	<code>\ll</code>	\neq	<code>\neq</code>
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TABLE 93: *AMS* Inequalities

\geqslant	\eqslantgtr	\gtreqdot	\lesseqgtr	\ngeq
\leqslant	\eqslantless	\gtreqless	\lesseqgtr	\ngeqq
\geqslanteq	\geqslant	\gtreqless	\lessgtr	\ngeqslant
\geqslantsim	\geqslant	\gtreqless	\lesssim	\ngtr
\ggg	\approx	\gtrsim	\lll	\nleq
\gnapprox	\approx	\gvertneqq	\lnapprox	\nleqq
\gneq	\leqslant	\leqq	\lneq	\nleqslant
\gneqq	\leqslant	\leqslant	\lneqq	\nless
\gnsim	\approx	\lessapprox	\lnsim	
\gtrapprox	\approx	\lessdot	\lvertneqq	

TABLE 94: *wasy sym* Inequalities

$$\gtrapprox \text{\textbackslash apprge} \quad \lessapprox \text{\textbackslash apprle}$$

TABLE 95: *txfonts/pf fonts* Inequalities

\ngt	\ngg	\ngtrsim	\ngtrless	\ngtrlessim
\ngtrapprox	\ngtrapprox	\ngtrlessapprox	\ngtrlessapprox	\nll
\ngtrless	\ngtrless	\ngtrless	\ngtrless	

TABLE 96: *mathabx* Inequalities

\geqslant	\eqslantgtr	\gtreqless	\lessapprox	\lesssim	\ngtr
\leqslant	\eqslantless	\gtreqless	\lessapprox	\lll	\ngtrapprox
\geq	\geqslant	\gtreqless	\lessapprox	\lll	\ngtrsim
\geqslantsim	\geqslant	\gtreqless	\lessapprox	\lnapprox	\nleq
\gg	\approx	\gvertneqq	\lessapprox	\lneq	\nleqq
\ggg	\lessapprox	\leq	\lessapprox	\lneqq	\nless
\gnapprox	\leqslant	\leq	\lessapprox	\lnsim	\nlessapprox
\gneq	\lessapprox	\lessapprox	\lessapprox	\lvertneqq	\nlesssim
\gneqq	\lessapprox	\lessdot	$\not\equiv$	\neqslantgtr	\nvareq
\gnsim	\lessapprox	\lesseqgtr	$\not\equiv$	\neqslantless	\nvarleq
\gtrapprox	\lessapprox	\lesseqgtr	$\not\equiv$	\neq	\vareq
\gtreqdot	\lessapprox	\lessgtr	$\not\equiv$	\neqeq	\varleq

mathabx defines \leqslant and \leq as synonyms for \leq , \geqslantsim and \geq as synonyms for \geq , \neqslantless as a synonym for \neq , and \neqslantgtr as a synonym for \neq .

TABLE 97: MnSymbol Inequalities

\geqslantgt	\eqslantgtr	\gtreqless	\lesssim	\lessapprox	\ngtrless
\leqslantless	\eqslantless	\gtrless	\ll	\lll	\ngtrlessslant
\geq	\geq	\gtrneqqless	\lll	\lll	\ngtreqless
\geqclosed	\geqclosed	\gtrsim	\lnapprox	\lnapprox	\ngtrless
\geqdot	\geqdot	\leq	\lneqq	\lneqq	\nleq
\geqq	\geqq	\leqclosed	\lnsim	\lnsim	\nleqclosed
\geqlant	\geqlant	\leqdot	\neqslantgtr	\neqslantgtr	\nleqdot
\geqlantdot	\geqlantdot	\leqq	\neqslantless	\neqslantless	\nleqq
\gg	\gg	\leqlant	\neq	\neq	\nleqlant
\ggg	\ggg	\leqlantdot	\ngeqclosed	\ngeqclosed	\nleqlantdot
\gnapprox	\gnapprox	\less	\ngeqdot	\ngeqdot	\nless
\gneqq	\gneqq	\lessapprox	\ngeqq	\ngeqq	\nlessclosed
\gnsim	\gnsim	\lessclosed	\ngeqlant	\ngeqlant	\nlessdot
\gtr	\gtr	\lessdot	\ngeqlantdot	\ngeqlantdot	\nlesseqgtr
\gtrapprox	\gtrapprox	\lesseqgtr	\ngg	\ngg	\nlesseqgtrslant
\gtrclosed	\gtrclosed	\lesseqgtrslant	\nggg	\nggg	\nlesseqgqtr
\gtrdot	\gtrdot	\lesseqgqtr	\ngtr	\ngtr	\nlessgtr
\gtreqless	\gtreqless	\lessgtr	\ngtrclosed	\ngtrclosed	\nll
\gtreqlessslant	\gtreqlessslant	\lessneqqgtr	\ngtrdot	\ngtrdot	\nlll

MnSymbol additionally defines synonyms for some of the preceding symbols:

\gggtr	(same as \ggg)
\gvertneqq	(same as \gneqq)
\lhd	(same as \lessclosed)
\lll	(same as \lll)
\lvertneqq	(same as \lneqq)
\ntrianglelefteq	(same as \nleqclosed)
\ntriangleleft	(same as \nlessclosed)
\ntrianglerighteq	(same as \ngeqclosed)
\ntriangleright	(same as \ngtrclosed)
\rhd	(same as \gtrclosed)
\trianglelefteq	(same as \leqclosed)
\trianglerighteq	(same as \geqclosed)
\unlhd	(same as \leqclosed)
\unrhd	(same as \geqclosed)
\vartriangleleft	(same as \lessclosed)
\vartriangleright	(same as \gtrclosed)

TABLE 98: AMS Triangle Relations

\blacktriangleleft	\blacktriangleright	\ntriangleleft	\ntriangleright	\triangleleft	\trianglelefteq
\blacktriangleright	\blacktriangleleft	\ntriangleright	\ntriangleleft	\triangleright	\trianglerighteq
\ntriangleleft	\ntriangleright	\triangleleft	\trianglelefteq	\vartriangleleft	\vartrianglelefteq
\ntrianglelefteq	\ntrianglerighteq	\trianglelefteq	\triangleleft	\vartriangleright	\vartrianglerighteq

TABLE 99: `stmaryrd` Triangle Relations

\trianglelefteqslant	<code>\trianglelefteqslant</code>	\trianglerighteqslant	<code>\trianglerighteqslant</code>
\ntrianglelefteqslant	<code>\ntrianglelefteqslant</code>	\ntrianglerighteqslant	<code>\ntrianglerighteqslant</code>

TABLE 100: `mathabx` Triangle Relations

\ntriangleleft	<code>\ntriangleleft</code>	\ntrianglerighteq	<code>\ntrianglerighteq</code>	\vartriangleright	<code>\vartriangleright</code>
\ntrianglelefteq	<code>\ntrianglelefteq</code>	\triangleleft	<code>\triangleleft</code>	\trianglerighteq	<code>\trianglerighteq</code>
\ntriangleright	<code>\ntriangleright</code>	\trianglelefteq	<code>\trianglelefteq</code>	\vartriangleleft	<code>\vartriangleleft</code>

TABLE 101: `MnSymbol` Triangle Relations

\blacktriangledown	<code>\filledmedtriangledown</code>	\triangle	<code>\largetriangleup</code>	\blacktriangledown	<code>\smalltriangledown</code>
\blacktriangleleft	<code>\filledmedtriangleleft</code>	\blacktriangledown	<code>\medtriangledown</code>	\blacktriangleleft	<code>\smalltriangleleft</code>
\blacktriangleright	<code>\filledmedtriangleright</code>	\blacktriangleleft	<code>\medtriangleleft</code>	\blacktriangleright	<code>\smalltriangleright</code>
\blacktriangleup	<code>\filledmedtriangleup</code>	\blacktriangleright	<code>\medtriangleright</code>	\blacktriangleup	<code>\smalltriangleup</code>
\blacktriangledown	<code>\filledtriangledown</code>	\triangle	<code>\medtriangleup</code>	\blacktriangledown	<code>\triangleeq</code>
\blacktriangleleft	<code>\filledtriangleleft</code>	\neq	<code>\ntriangleeq</code>	\triangleleft	<code>\trianglelefteq</code>
\blacktriangleright	<code>\filledtriangleright</code>	\neq	<code>\ntriangleleft</code>	\triangleleft	<code>\trianglerighteq</code>
\blacktriangleup	<code>\filledtriangleup</code>	\neq	<code>\ntrianglelefteq</code>	\trianglelefteq	<code>\vartriangleleft</code>
\blacktriangledown	<code>\largetriangledown</code>	\neq	<code>\ntriangleright</code>	\triangleright	<code>\vartriangleright</code>
\blacktriangleleft	<code>\largetriangleleft</code>	\neq	<code>\ntrianglerighteq</code>	\trianglerighteq	<code>\vartrianglerighteq</code>
\blacktriangleright	<code>\largetriangleright</code>	\circledcirc	<code>\otriangle</code>		

`MnSymbol` additionally defines synonyms for many of the preceding symbols: `\triangleeq` is a synonym for `\triangleeqq`; `\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`; `\lessclosed` is a synonym for `\ntriangleleft`; `\gtrclosed` is a synonym for `\ntriangleright`; `\leqclosed` is a synonym for `\ntrianglelefteq`; and `\geqclosed` is a synonym for `\ntrianglerighteq`.

The title “Triangle Relations” is a bit of a misnomer here as only `\triangleeqq` and `\ntriangleeqq` 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 102: Arrows

\Downarrow	<code>\Downarrow</code>	\Longleftarrow	<code>\longleftarrow</code>	\nwarrow	<code>\nwarrow</code>
\downarrow	<code>\downarrow</code>	\Longleftarrow	<code>\Longleftarrow</code>	\Rightarrow	<code>\Rightarrow</code>
\hookleftarrow	<code>\hookleftarrow</code>	\Longleftarrow	<code>\Longleftarrow</code>	\rightarrow	<code>\rightarrow</code>
\hookrightarrow	<code>\hookrightarrow</code>	\Longleftarrow	<code>\Longleftarrow</code>	\searrow	<code>\searrow</code>
\leadsto^*	<code>\leadsto^*</code>	\Longleftarrow	<code>\Longleftarrow</code>	\swarrow	<code>\swarrow</code>
\leftarrow	<code>\leftarrow</code>	\Longleftarrow	<code>\Longleftarrow</code>	\uparrow	<code>\uparrow</code>
\Leftarrow	<code>\Leftarrow</code>	\Longleftarrow	<code>\Longleftarrow</code>	\Uparrow	<code>\Uparrow</code>
\Leftrightarrow	<code>\Leftrightarrow</code>	\Longleftarrow	<code>\Longleftarrow</code>	\Updownarrow	<code>\Updownarrow</code>
\leftrightarrow	<code>\leftrightarrow</code>	\nearrow	<code>\nearrow</code>	\Downarrow	<code>\Downarrow</code>

* Not predefined in L^AT_EX 2_&. Use one of the packages `latexsym`, `amsfonts`, `amssymb`, `txfonts`, `pxfonts`, or `wasysym`.

[†] See the note beneath Table 169 for information about how to put a diagonal arrow across a mathematical expression (as in “ $\nabla \cdot \overset{0}{B}$ ”).

TABLE 103: Harpoons

\leftarrow	<code>\leftharpoondown</code>	\rightarrow	<code>\rightharpoondown</code>	\rightleftharpoons	<code>\rightleftharpoons</code>
\leftarrow	<code>\leftharpoonup</code>	\rightarrow	<code>\rightharpoonup</code>		

TABLE 104: `textcomp` Text-mode Arrows

\downarrow	<code>\textdownarrow</code>	\rightarrow	<code>\textrightarrow</code>
\leftarrow	<code>\textleftarrow</code>	\uparrow	<code>\textuparrow</code>

TABLE 105: *AMS* Arrows

\circlearrowleft	<code>\circlearrowleft</code>	\leftrightsquigarrow	<code>\leftrightsquigarrow</code>	\rightleftarrows	<code>\rightleftarrows</code>
\circlearrowright	<code>\circlearrowright</code>	\rightleftarrows	<code>\rightleftarrows</code>	\rightleftarrows	<code>\rightleftarrows</code>
\curvearrowleft	<code>\curvearrowleft</code>	\rightsquigarrow	<code>\rightsquigarrow</code>	\rightsquigarrow	<code>\rightsquigarrow</code>
\curvearrowright	<code>\curvearrowright</code>	\Lleftarrow	<code>\Lleftarrow</code>	\Rsh	<code>\Rsh</code>
\dashleftarrow	<code>\dashleftarrow</code>	\looparrowleft	<code>\looparrowleft</code>	\twoheadleftarrow	<code>\twoheadleftarrow</code>
\dashrightarrow	<code>\dashrightarrow</code>	\looparrowright	<code>\looparrowright</code>	\twoheadrightarrow	<code>\twoheadrightarrow</code>
\downdownarrows	<code>\downdownarrows</code>	\Lsh	<code>\Lsh</code>	\upuparrows	<code>\upuparrows</code>
\leftarrowtail	<code>\leftarrowtail</code>	\rightarrowtail	<code>\rightarrowtail</code>		

TABLE 106: *AMS* Negated Arrows

$\not\equiv$	<code>\not\equiv</code>	$\not\Leftarrow$	<code>\not\Leftarrow</code>	$\not\Rightarrow$	<code>\not\Rightarrow</code>
$\not\leftarrow$	<code>\not\leftarrow</code>	$\not\leftrightharpoons$	<code>\not\leftrightharpoons</code>	$\not\rightarrow$	<code>\not\rightarrow</code>

TABLE 107: *AMS* Harpoons

\downharpoonleft	<code>\downharpoonleft</code>	\downharpoonright	<code>\downharpoonright</code>	\upharpoonleft	<code>\upharpoonleft</code>
\downharpoonright	<code>\downharpoonright</code>	\upharpoonleft	<code>\upharpoonleft</code>	\upharpoonright	<code>\upharpoonright</code>

TABLE 108: stmaryrd Arrows

\leftarrow	<code>\leftarrowtriangle</code>	\Leftarrow	<code>\Mapsfrom</code>	\leftarrow	<code>\shortleftarrow</code>
\Leftarrow	<code>\leftrightarroweq</code>	\Leftarrow	<code>\mapsfrom</code>	\rightarrow	<code>\shortrightarrow</code>
\Leftrightarrow	<code>\leftrightarrowtriangle</code>	\Rightarrow	<code>\Mapsto</code>	\uparrow	<code>\shortuparrow</code>
$\not\equiv$	<code>\lightning</code>	\nearrow	<code>\nnearrow</code>	\downarrow	<code>\ssearrow</code>
\Longleftarrow	<code>\Longmapsfrom</code>	\nwarrow	<code>\nwarrow</code>	\downarrow	<code>\sswarrow</code>
\Longleftarrow	<code>\longmapsfrom</code>	\rightarrow	<code>\rightarrowtriangle</code>		
\Longrightarrow	<code>\Longmapsto</code>	\downarrow	<code>\shortdownarrow</code>		

TABLE 109: txfonts/pffonts Arrows

$\square\lhd$	<code>\boxdotLeft</code>	$\odot\rightarrow$	<code>\circleddotright</code>	$\lhd\Diamond$	<code>\Diamondleft</code>
$\square\lhd$	<code>\boxdotleft</code>	$\lhd\odot$	<code>\circleleft</code>	$\lhd\Diamond$	<code>\Diamondright</code>
$\square\rightarrow$	<code>\boxdotright</code>	$\odot\rightarrow$	<code>\circleright</code>	$\lhd\Diamond$	<code>\DiamondRight</code>
$\square\rightarrow$	<code>\boxdotRight</code>	\leftrightarrow	<code>\dashleftrightarrow</code>	$\rightsquigarrow\lhd$	<code>\leftsquigarrow</code>
$\square\lhd$	<code>\boxLeft</code>	$\lhd\lhd$	<code>\DiamonddotLeft</code>	$\nearrow\lhd$	<code>\Nearrow</code>
$\square\lhd$	<code>\boxleft</code>	$\lhd\lhd$	<code>\Diamonddotleft</code>	$\nwarrow\lhd$	<code>\Nwarrow</code>
$\square\rightarrow$	<code>\boxright</code>	$\lhd\lhd$	<code>\Diamonddotright</code>	$\Rightarrow\lhd$	<code>\Rrightarrow</code>
$\square\rightarrow$	<code>\boxRight</code>	$\lhd\lhd$	<code>\DiamonddotRight</code>	$\searrow\lhd$	<code>\Searrow</code>
$\lhd\odot$	<code>\circleddotleft</code>	$\lhd\lhd$	<code>\DiamondLeft</code>	$\swarrow\lhd$	<code>\Swarrow</code>

TABLE 110: mathabx Arrows

\circlearrowleft	<code>\circlearrowleft</code>	\leftarrow	<code>\leftarrow</code>	\nearrow	<code>\narrow</code>
\circlearrowright	<code>\circlearrowright</code>	\Leftarrow	<code>\leftleftarrows</code>	\restriction	<code>\restriction</code>
\curvearrowbotleft	<code>\curvearrowbotleft</code>	\Leftrightarrow	<code>\leftrightarrow</code>	\rightarrow	<code>\rightarrow</code>
\curvearrowbotleftright	<code>\curvearrowbotleftright</code>	\Leftrightarrow	<code>\leftrightarrows</code>	\rightarrow	<code>\rightleftarrows</code>
\curvearrowbotright	<code>\curvearrowbotright</code>	$\rightsquigarrow\rightsquigarrow\rightsquigarrow$	<code>\leftrightsquigarrow</code>	\rightarrow	<code>\rightrightarrows</code>
\curvearrowleft	<code>\curvearrowleft</code>	$\rightsquigarrow\rightsquigarrow\rightsquigarrow$	<code>\leftsquigarrow</code>	$\rightsquigarrow\rightsquigarrow\rightsquigarrow$	<code>\rightsquigarrow</code>
\curvearrowleftright	<code>\curvearrowleftright</code>	$\rightsquigarrow\rightsquigarrow\rightsquigarrow$	<code>\lefttorightarrow</code>	$\rightsquigarrow\rightsquigarrow\rightsquigarrow$	<code>\righttoleftarrow</code>
\curvearrowright	<code>\curvearrowright</code>	$\leftarrow\leftarrow\leftarrow$	<code>\looparrowdownleft</code>	$\rightarrow\rightarrow\rightarrow$	<code>\Rsh</code>
\dsh	<code>\dsh</code>	$\leftarrow\leftarrow\leftarrow$	<code>\looparrowdownright</code>	$\nearrow\searrow\swarrow$	<code>\searrow</code>
\downdownarrows	<code>\downdownarrows</code>	$\leftarrow\leftarrow\leftarrow$	<code>\looparrowleft</code>	$\nearrow\searrow\swarrow$	<code>\swarrow</code>
\downtouparrow	<code>\downtouparrow</code>	$\leftarrow\leftarrow\leftarrow$	<code>\looparrowright</code>	$\upuparrows\upuparrows\upuparrows$	<code>\updownarrows</code>
\downuparrows	<code>\downuparrows</code>	$\leftarrow\leftarrow\leftarrow$	<code>\Lsh</code>	$\upuparrows\upuparrows\upuparrows$	<code>\uptodownarrow</code>
\drsh	<code>\drsh</code>	$\nearrow\nearrow\nearrow$	<code>\nearrow</code>	$\upuparrows\upuparrows\upuparrows$	<code>\upuparrows</code>

TABLE 111: mathabx Negated Arrows

\Leftarrow	<code>\nLeftarrow</code>	\Leftrightarrow	<code>\nleftrightarrow</code>	\rightarrow	<code>\nrightarrow</code>
\Leftarrow	<code>\nleftarrow</code>	\Leftrightarrow	<code>\nLeftrightarrow</code>	\Rightarrow	<code>\nRightarrow</code>

TABLE 112: mathabx Harpoons

\Leftarrow	$\bar{\text{b}}\text{arleftharpoon}$	\Leftarrow	$\text{l}\text{eftharpoonup}$	\Leftarrow	$\text{r}\text{ightleftharpoons}$
\Rightarrow	$\bar{\text{b}}\text{arrightharpoon}$	\Leftarrow	$\text{l}\text{eftleftharpoons}$	\Rightarrow	$\text{r}\text{ightrightharpoons}$
\Downarrow	$\downarrow\text{downdownharpoons}$	\Leftarrow	$\text{l}\text{eftrightharpoon}$	\Downarrow	updownharpoons
\downarrow	$\downarrow\text{downharpoonleft}$	\Leftarrow	$\text{l}\text{eftrightharpoons}$	\downarrow	upharpoonleft
\downarrow	$\downarrow\text{downharpoonright}$	\Rightarrow	rightbarharpoon	\downarrow	upharpoonright
\Updownarrow	$\updownarrow\text{downupharpoons}$	\rightarrow	rightharpoondown	\Updownarrow	upupharpoons
\Leftarrow	$\Leftarrow\text{leftbarharpoon}$	\rightarrow	rightharpoonup		
\Leftarrow	$\Leftarrow\text{l}\text{eftharpoondown}$	\Leftarrow	rightleftharpoon		

TABLE 113: MnSymbol Arrows

\curvearrowdownup	←	\longleftarrow	↙	\rhookswarrow
\curvearrowleftright	⇐	\Longleftarrow	↑	\rhookuparrow
\curvearrownesw	↔	\longleftrightarrow	→	\rightarrow
\curvearrownwse	⇒	\Longleftrightarrow	⇒	\Rightarrow
\curvearrowrightleft	→	\longmapsto	↘	\rightarrowtail
\curvearrowsenw	→	\longrightarrow	↗	\leftarrowtail
\curvearrowswne	⇒	\Longrightarrow	↖	\leftarrows
\curvearrowupdown	⌚	\looparrowleft	↗	\rightmapsto
\dasheddownarrow	⌚	\looparrowright	⇒	\rightrightarrow
\dashedleftarrow	↶	\Lsh	↘	\rightrightarrow
\dashednearrow	↗	\nearrow	⇒	\rightarrow
\dashednarrow	↗	\Nearrow	↶	\Rsh
\dashedrightarrow	↗	\nearrowtail	↘	\searrow
\dashedsearrow	↗	\nelsquigarrow	⤵	\Searrow
\dashedswarrow	⤵	\nemapsto	⤴	\searrowtail
\dasheduparrow	⤵	\nenarrows	⤷	\selsquigarrow
\Downarrow	⤵	\nersquigarrow	⤸	\semapsto
\downarrow	⤵	\neswarrow	⤹	\senarrows
\downarrowtail	⤵	\Neswarrow	⤻	\sersquigarrow
\downdownarrows	⤵	\neswarrows	⤻	\sesearrows
\downlsquigarrow	⤵	\narrow	⤷	\squigarrowdownup
\downmapsto	⤵	\Narrow	⤷	\squigarrowleftright
\downrsquigarrow	⤵	\narrowtail	⤷	\squigarrownesw
\downuparrows	⤵	\nwlsquigarrow	⤷	\squigarrownwse
\lcurvearrowdown	⤵	\nwmapsto	⤷	\squigarrowrightleft
\lcurvearrowleft	⤵	\nwnwarrows	⤷	\squigarrowsenw
\lcurvearrowright	⤵	\nwsquigarrow	⤷	\squigarrowswne
\lcurvearrowup	⤵	\nwsearrow	⤷	\squigarrowupdown
\lcurvearrowdown	⤵	\Nwsearrow	⤷	\swarrow
\lcurvearrowleft	⤵	\nwsearrows	⤷	\Swarrow
\lcurvearrowne	⤵	\partialoval{lcircle}{left}{tint}	⤷	\swallowtail
\lcurvearrownw	⤵	\partialoval{lcircle}{right}{tint}	⤷	\swlsquigarrow
\lcurvearrowright	⤵	\partialoval{rcircle}{left}{tint}	⤷	\swmapsto
\lcurvearrowse	⤵	\partialoval{rcircle}{right}{tint}	⤷	\swnearrows
\lcurvearrowsw	⤵	\partialoval{artlcircle}{left}{tint}	⤷	\swrsquigarrow
\lcurvearrowup	⤵	\partialoval{artrcircle}{right}{tint}	⤷	\swswallows
\Leftarrow	⤵	\partialoval{vartrc}{circle}{left}{tint}	⤷	\twoheaddownarrow

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←	\leftarrow	↶	\partialleftarrow	↶↑	\twoheadleftarrow
↖	\leftarrowtail	↷	\partialrightarrow	↗	\twoheadnearrow
⤲	\leftleftarrows	↶↷	\partialleftrightarrow	⤳	\twoheadnarrow
⤷	\leftlsquigarrow	↶↷↶↷	\partialleftrightarrow	⤸	\twoheadrightarrow
⤹	\leftmapsto	↶↷↶↷↶↷	\partialleftrightarrow	⤹	\twoheadsearrow
⤻	\leftrightarrow	↶↷↶↷↶↷↶↷	\partialleftrightarrow	⤻	\twoheadswarrow
⤼	\Leftrightarrow	↶↷↶↷↶↷↶↷↶↷	\partialleftrightarrow	⤼	\twoheaduparrow
⤽	\leftrightarrows	↶↷↶↷↶↷↶↷↶↷↶↷	\partialleftrightarrow	⤽	\uparrowarrow
⤾	\leftrsquigarrow	↶↷↶↷↶↷↶↷↶↷↶↷	\partialleftrightarrow	⤾	\Uparrowarrow
⤿	\lhookdownarrow	↶↷↶↷↶↷↶↷↶↷↶↷	\partialleftrightarrow	⤿	\uparrowarrowtail
⤱	\lhookleftarrow	↶↷↶↷↶↷↶↷↶↷↶↷	\partialleftrightarrow	⤱	\updownarrowarrow
⤲	\lhooknearrow	↶↷↶↷↶↷↶↷↶↷↶↷	\partialleftrightarrow	⤲	\Updownarrowarrow
⤳	\lhooknwarrow	↶↷↶↷↶↷↶↷↶↷↶↷	\partialleftrightarrow	⤳	\updownarrows
⤴	\lhookrightarrow	↶↷↶↷↶↷↶↷↶↷↶↷	\partialleftrightarrow	⤴	\uplsquigarrow
⤵	\lhooksearrow	↶↷↶↷↶↷↶↷↶↷↶↷	\partialleftrightarrow	⤵	\upmapsto
⤶	\lhookswarrow	↶↷↶↷↶↷↶↷↶↷↶↷	\partialleftrightarrow	⤶	\uprsquigarrow
⤷	\lhookuparrow	↶↷↶↷↶↷↶↷↶↷↶↷	\partialleftrightarrow	⤷	\upuparrows
⤸	\lightning	↶↷↶↷↶↷↶↷↶↷↶↷	\partialleftrightarrow		
⤹	\Lleftarrow	↶↷↶↷↶↷↶↷↶↷↶↷	\partialleftrightarrow		

MnSymbol additionally defines synonyms for some of the preceding symbols:

\circlearrowleft	\circlearrowright	(same as \rcirclearrowup)
\curvearrowleft	\curvearrowright	(same as \lcurvearrowup)
\curvearrowleft	\curvearrowright	(same as \rcurvearrowleft)
\curvearrowright	\curvearrowleft	(same as \lcurvearrowright)
\dashleftarrow	\dashrightarrow	(same as \dashedleftarrow)
\dashleftarrow	\dashrightarrow	(same as \dashedrightarrow)
\hookleftarrow	\hookrightarrow	(same as \rhookleftarrow)
\hookleftarrow	\hookrightarrow	(same as \lhookrightarrow)
\leadsto		(same as \rightlarrow)
\leftrightsquigarrow		(same as \squigarrowleftright)
\mapsto		(same as \rightmapsto)
\rightsquigarrow		(same as \rightlarrow)

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

TABLE 114: MnSymbol Negated Arrows

\ncurvearrowdownup	\nlhooknarrow	\nrightleftarrows
\ncurvearrowleftright	\nlhookrightarrow	\nrightlsquigarrow
\curvearrownesw	\nlhooksearrow	\nrightmapsto
\curvearrownwse	\nlhookswarrow	\nrightrightarrows
\curvearrowrightleft	\nlhookuparrow	\nrightrsquigarrow
\curvearrowsenw	\nLleftarrow	\nRightarrow
\curvearrowswne	\nnearrow	\nSearrow
\curvearrowupdown	\nNearrow	\nsearrow

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\downarrow	<code>\ndasheddownarrow</code>	\nwarrowtail	<code>\nnearrowtail</code>	\nsearrowtail	<code>\nsearrowtail</code>
\leftarrow	<code>\ndashedleftarrow</code>	\nnelsquigarrow	<code>\nnelsquigarrow</code>	\nselsquigarrow	<code>\nselsquigarrow</code>
\nearrow	<code>\ndashednearrow</code>	\nnemapsto	<code>\nnemapsto</code>	\nsemapsto	<code>\nsemapsto</code>
\swarrow	<code>\ndashednarrow</code>	\nnenearrows	<code>\nnenearrows</code>	\nsenwarrows	<code>\nsenwarrows</code>
\rightarrow	<code>\ndashedrightarrow</code>	\nnersquigarrow	<code>\nnersquigarrow</code>	\nsersquigarrow	<code>\nsersquigarrow</code>
\searrow	<code>\ndashedsearrow</code>	\nNesarrow	<code>\nNesarrow</code>	\nsesearrows	<code>\nsesearrows</code>
\leftarrow	<code>\ndashedswarrow</code>	\nnesarrow	<code>\nnesarrow</code>	\nsquigarrowdownup	<code>\nsquigarrowdownup</code>
\uparrow	<code>\ndasheduparrow</code>	\nneswarrows	<code>\nneswarrows</code>	\nsquigarrowleftright	<code>\nsquigarrowleftright</code>
\downarrow	<code>\ndownarrow</code>	\nNarrow	<code>\nNarrow</code>	\nsquigarrownesw	<code>\nsquigarrownesw</code>
\Downarrow	<code>\nDownarrow</code>	\nnarrow	<code>\nnarrow</code>	\nsquigarrownwse	<code>\nsquigarrownwse</code>
\Downarrow	<code>\ndownarrowtail</code>	\nnarrowtail	<code>\nnarrowtail</code>	\nsquigarrowrightleft	<code>\nsquigarrowrightleft</code>
\Downarrow	<code>\ndowndownarrows</code>	\nnlsquigarrow	<code>\nnlsquigarrow</code>	\nsquigarrowsenw	<code>\nsquigarrowsenw</code>
\Downarrow	<code>\ndownlsquigarrow</code>	\nnwmapsto	<code>\nnwmapsto</code>	\nsquigarrowswne	<code>\nsquigarrowswne</code>
\Downarrow	<code>\downmapsto</code>	\nnwnwarrows	<code>\nnwnwarrows</code>	\nsquigarrowupdown	<code>\nsquigarrowupdown</code>
\Downarrow	<code>\downrsquigarrow</code>	\nnwrsquigarrow	<code>\nnwrsquigarrow</code>	\nswarrow	<code>\nswarrow</code>
\Downarrow	<code>\downuparrows</code>	\nnwsearrow	<code>\nnwsearrow</code>	\nSwarrow	<code>\nSwarrow</code>
\bullet	<code>\nlclearrowdown</code>	\nNwsearrow	<code>\nNwsearrow</code>	\nswarrowtail	<code>\nswarrowtail</code>
\bullet	<code>\nlclearrowleft</code>	\nNwsearrows	<code>\nNwsearrows</code>	\nswlsquigarrow	<code>\nswlsquigarrow</code>
\bullet	<code>\nlclearrowright</code>	\nrclearrowdown	<code>\nrclearrowdown</code>	\nswmapsto	<code>\nswmapsto</code>
\bullet	<code>\nlclearrowup</code>	\nrclearrowleft	<code>\nrclearrowleft</code>	\nswnearrows	<code>\nswnearrows</code>
\curvearrowright	<code>\nlcurvearrowdown</code>	\nrclearrowright	<code>\nrclearrowright</code>	\nswrsquigarrow	<code>\nswrsquigarrow</code>
\curvearrowleft	<code>\nlcurvearrowleft</code>	\nrclearrowup	<code>\nrclearrowup</code>	\nswswallows	<code>\nswswallows</code>
\curvearrowright	<code>\nlcurvearrowne</code>	\nrcurvearrowdown	<code>\nrcurvearrowdown</code>	\ntwoheaddownarrow	<code>\ntwoheaddownarrow</code>
\curvearrowleft	<code>\nlcurvearrownw</code>	\nrcurvearrowleft	<code>\nrcurvearrowleft</code>	\ntwoheadleftarrow	<code>\ntwoheadleftarrow</code>
\curvearrowright	<code>\nlcurvearrowright</code>	\nrcurvearrowne	<code>\nrcurvearrowne</code>	\ntwoheadnearrow	<code>\ntwoheadnearrow</code>
\curvearrowleft	<code>\nlcurvearrowse</code>	\nrcurvearrownw	<code>\nrcurvearrownw</code>	\ntwoheadnarrow	<code>\ntwoheadnarrow</code>
\curvearrowright	<code>\nlcurvearrowsw</code>	\nrcurvearrowright	<code>\nrcurvearrowright</code>	\ntwoheadrightarrow	<code>\ntwoheadrightarrow</code>
\curvearrowleft	<code>\nlcurvearrowup</code>	\nrcurvearrowse	<code>\nrcurvearrowse</code>	\ntwoheadsearrow	<code>\ntwoheadsearrow</code>
\Leftarrow	<code>\nLeftarrow</code>	\nrcurvearrowsw	<code>\nrcurvearrowsw</code>	\ntwoheadswarrow	<code>\ntwoheadswarrow</code>
\Leftarrow	<code>\nleftarrow</code>	\nrcurvearrowup	<code>\nrcurvearrowup</code>	\ntwoheaduparrow	<code>\ntwoheaduparrow</code>
\Leftarrow	<code>\nleftarrowtail</code>	\nrhookdownarrow	<code>\nrhookdownarrow</code>	\nuparrow	<code>\nuparrow</code>
\Leftarrow	<code>\nleftleftarrows</code>	\nrhookleftarrow	<code>\nrhookleftarrow</code>	\nUparrow	<code>\nUparrow</code>
\Leftarrow	<code>\nleftlsquigarrow</code>	\nrhooknearrow	<code>\nrhooknearrow</code>	\nuparrowtail	<code>\nuparrowtail</code>
\Leftarrow	<code>\leftmapsto</code>	\nrhooknarrow	<code>\nrhooknarrow</code>	\nupdownarrow	<code>\nupdownarrow</code>
\Leftarrow	<code>\nleftrightarrow</code>	\nrhookrightarrow	<code>\nrhookrightarrow</code>	\nUpdownarrow	<code>\nUpdownarrow</code>
\Leftarrow	<code>\nleftrightarrow</code>	\nrhooksearrow	<code>\nrhooksearrow</code>	\nupdownarrows	<code>\nupdownarrows</code>
\Leftarrow	<code>\nleftrightsarrows</code>	\nrhookswarrow	<code>\nrhookswarrow</code>	\nuplsquigarrow	<code>\nuplsquigarrow</code>
\Leftarrow	<code>\nlefrightsquigarrow</code>	\nrhookuparrow	<code>\nrhookuparrow</code>	\nupmapsto	<code>\nupmapsto</code>
\Leftarrow	<code>\nlhookdownarrow</code>	\nrightarrow	<code>\nrightarrow</code>	\nuprsquigarrow	<code>\nuprsquigarrow</code>
\Leftarrow	<code>\nlhookleftarrow</code>	\nRightarrow	<code>\nRightarrow</code>	\nupuparrows	<code>\nupuparrows</code>
\Leftarrow	<code>\nlhooknearrow</code>	\nrightarrowtail	<code>\nrightarrowtail</code>		

MnSymbol additionally defines synonyms for some of the preceding symbols:

\circlearrowleft	<code>\ncirclearrowleft</code>	(same as <code>\nrcirclearrowup</code>)
\circlearrowright	<code>\ncirclearrowright</code>	(same as <code>\nlcirclearrowup</code>)
\curvearrowleft	<code>\curvearrowleft</code>	(same as <code>\nrcurvearrowleft</code>)
\curvearrowright	<code>\curvearrowright</code>	(same as <code>\nlcurvearrowright</code>)
\dasharrow	<code>\ndasharrow</code>	(same as <code>\ndashedrightarrow</code>)
\dashleftarrow	<code>\dashleftarrow</code>	(same as <code>\ndashedleftarrow</code>)
\dashrightarrow	<code>\dashrightarrow</code>	(same as <code>\ndashedrightarrow</code>)
\leftarrow	<code>\ngleftarrow</code>	(same as <code>\nleftarrow</code>)
\leftarrow	<code>\nhookleftarrow</code>	(same as <code>\nrhookleftarrow</code>)
\leftarrow	<code>\nhookrightarrow</code>	(same as <code>\nlhookrightarrow</code>)
\leadsto	<code>\nleadsto</code>	(same as <code>\nrightarrowlsquigarrow</code>)
\leftrightarrow	<code>\nleftrightsquigarrow</code>	(same as <code>\nsquigarrowleftright</code>)
\mapsto	<code>\nmapsto</code>	(same as <code>\nrightmapsto</code>)
\rightsquigarrow	<code>\rightsquigarrow</code>	(same as <code>\nrightlsquigarrow</code>)
\rightarrow	<code>\nto</code>	(same as <code>\nrightarrow</code>)

TABLE 115: MnSymbol Harpoons

\downarrow	<code>\downharpoonccw*</code>	\nearrow	<code>\neswharpoons</code>	\searrow	<code>\seharpooncw</code>
\downarrow	<code>\downharpooncw*</code>	\nwarrow	<code>\neswharpoonsenw</code>	\swarrow	<code>\senwharpoons</code>
\Downarrow	<code>\downupharpoons</code>	\nearrow	<code>\nwharpoonccw</code>	\swarrow	<code>\swharpoonccw</code>
\leftarrow	<code>\leftharpoonccw*</code>	\nwarrow	<code>\nwharpooncw</code>	\swarrow	<code>\swharpooncw</code>
\leftarrow	<code>\leftharpooncw*</code>	\nwarrow	<code>\nwseharpoonnesw</code>	\swarrow	<code>\swneharpoons</code>
\leftarrow	<code>\leftrightharpoondownup</code>	\nwarrow	<code>\nwseharpoons</code>	\uparrow	<code>\updownharpoonleftright</code>
\Leftarrow	<code>\leftrightharpoons</code>	\nwarrow	<code>\nwseharpoonswne</code>	\uparrow	<code>\updownharpoonrightleft</code>
\leftarrow	<code>\leftrightharpoonupdown</code>	\nwarrow	<code>\rightharpoonccw*</code>	\Downarrow	<code>\updownharpoons</code>
\nearrow	<code>\neharpoonccw</code>	\rightarrow	<code>\rightharpooncw*</code>	\uparrow	<code>\upharpoonccw*</code>
\nearrow	<code>\neharpooncw</code>	\Rightarrow	<code>\rightleftharpoons</code>	\uparrow	<code>\upharpooncw*</code>
\nearrow	<code>\neswharpoonnwse</code>	\nwarrow	<code>\seharpoonccw</code>		

* 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 116: MnSymbol Negated Harpoons

\dagger	<code>\ndownharpoonccw*</code>	\ddagger	<code>\nneswharpoons</code>	\ddagger	<code>\nseharpooncw</code>
\dagger	<code>\ndownharpooncw*</code>	\ddagger	<code>\nneswharpoonsenw</code>	\ddagger	<code>\nsewharpoons</code>
\ddagger	<code>\ndownupharpoons</code>	\ddagger	<code>\nnwharpoonccw</code>	\ddagger	<code>\nswharpoonccw</code>
\ddagger	<code>\nleftharpoonccw*</code>	\ddagger	<code>\nnwharpooncw</code>	\ddagger	<code>\nswharpooncw</code>
\ddagger	<code>\nleftharpooncw*</code>	\ddagger	<code>\nnwseharpoonnesw</code>	\ddagger	<code>\nswneharpoons</code>
\ddagger	<code>\nleftrightharpoondownup</code>	\ddagger	<code>\nnwseharpoons</code>	\ddagger	<code>\nupdownharpoonleftright</code>
\ddagger	<code>\nleftrightharpoons</code>	\ddagger	<code>\nnwseharpoonswne</code>	\ddagger	<code>\nupdownharpoonrightleft</code>
\ddagger	<code>\nleftrightharpoonupdown</code>	\ddagger	<code>\rightharpoonccw*</code>	\ddagger	<code>\nupdownharpoons</code>
\times	<code>\nneharpoonccw</code>	\times	<code>\rightharpooncw*</code>	\dagger	<code>\nupharpoonccw*</code>
\times	<code>\nneharpooncw</code>	\times	<code>\rightleftharpoons</code>	\dagger	<code>\nupharpooncw*</code>
\times	<code>\nneswharpoonnwse</code>	\times	<code>\nseharpoonccw</code>		

* 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 117: harpoon Extensible Harpoons

\overleftarrow{abc}	<code>\overleftharp{abc}</code>	\overrightarrow{abc}	<code>\overrightharpdown{abc}</code>	\underline{abc}	<code>\underrightharp{abc}</code>
\overleftarrow{abc}	<code>\overleftharpdown{abc}</code>	\underline{abc}	<code>\underleftharp{abc}</code>	\overline{abc}	<code>\underrightharpdowm{abc}</code>
\overrightarrow{abc}	<code>\overrightharp{abc}</code>	\overleftarrow{abc}	<code>\underleftharpdown{abc}</code>		

All of the `harpoon` symbols are implemented using the `graphics` package (specifically, `graphics`'s `\resizebox` command). Consequently, only TeX backends that support graphical transformations (e.g., *not* Xdvi) can properly display these symbols.

TABLE 118: chemarrow Arrows

\rightarrow `\chemarrow`

TABLE 119: fge Arrows

\Rightarrow `\fgerightarrow` \uparrow `\fgeuparrow`

TABLE 120: MnSymbol Spoons

\downarrow	<code>\downfilledspoon</code>	\nwarrow	<code>\nnespoon</code>	\nwarrow	<code>\nwfilledspoon</code>
\downarrow	<code>\downspoon</code>	\nwarrow	<code>\nnwfilledspoon</code>	\nwarrow	<code>\nwspoon</code>
\leftarrow	<code>\leftfilledspoon</code>	\nwarrow	<code>\nnwspoon</code>	\rightarrow	<code>\rightfilledspoon</code>
\leftarrow	<code>\leftspoon</code>	\rightarrow	<code>\nrightfilledspoon</code>	\rightarrow	<code>\rightspoon^*</code>
\downarrow	<code>\ndownfilledspoon</code>	\rightarrow	<code>\nrightspoon^*</code>	\nwarrow	<code>\sefilledspoon</code>
\downarrow	<code>\ndownspoon</code>	\rightarrow	<code>\nsefilledspoon</code>	\nwarrow	<code>\sespoon</code>
\nearrow	<code>\nefilledspoon</code>	\nwarrow	<code>\nsespoon</code>	\swarrow	<code>\swfilledspoon</code>
\nearrow	<code>\nespoon</code>	\nwarrow	<code>\nswfilledspoon</code>	\swarrow	<code>\swoopspoon</code>
\nearrow	<code>\nleftfilledspoon</code>	\nwarrow	<code>\nswspoon</code>	\uparrow	<code>\upfilledspoon</code>
\nearrow	<code>\nleftspoon</code>	\uparrow	<code>\nupfilledspoon</code>	\uparrow	<code>\upspoon</code>
\nearrow	<code>\nnefilledspoon</code>	\uparrow	<code>\nupspoon</code>		

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

TABLE 121: MnSymbol Pitchforks

Ψ	<code>\downpitchfork</code>	\divideontimes	<code>\nnwpitchfork</code>	\ni	<code>\rightpitchfork</code>
\Leftarrow	<code>\leftpitchfork</code>	$\not\equiv$	<code>\nrightpitchfork</code>	$\not\approx$	<code>\sepitchfork</code>
Ψ	<code>\ndownpitchfork</code>	\divideontimes	<code>\nsepitchfork</code>	$\not\approx$	<code>\swpitchfork</code>
$\not\approx$	<code>\nepitchfork</code>	\divideontimes	<code>\nswpitchfork</code>	$\not\vdash$	<code>\uppitchfork</code>
$\not\equiv$	<code>\nleftpitchfork</code>	$\not\vdash$	<code>\nuppitchfork</code>		
$\not\approx$	<code>\nnepitchfork</code>	$\not\approx$	<code>\nwpitchfork</code>		

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

TABLE 122: MnSymbol Smiles and Frowns

\approx	<code>\doublefrown</code>	$\not\approx$	<code>\nsmileeq</code>	\asymp	<code>\smileeq</code>
\approxeq	<code>\doublefrownneq</code>	$\not\approxeq$	<code>\nsmileeqfrown</code>	\asymp	<code>\smileeqfrown</code>
\asymp	<code>\doublesmile</code>	$\not\asymp$	<code>\nsmilefrown</code>	\asymp	<code>\smilefrown</code>
$\approxeq\asymp$	<code>\doublesmileeq</code>	$\not\approxeq\asymp$	<code>\nsmilefrownneq</code>	\asymp	<code>\smilefrownneq</code>
$\approx\sim$	<code>\eqfrown</code>	$\not\approx\sim$	<code>\nsqdoublefrown</code>	\approx	<code>\sqdoublefrown</code>
$\approx\cong$	<code>\eqsmile</code>	$\not\approx\cong$	<code>\nsqdoublefrownneq</code>	\approx	<code>\sqdoublefrownneq</code>
\sim	<code>\frown</code>	$\not\sim$	<code>\nsqdoublesmile</code>	\approx	<code>\sqdoublesmile</code>
$\approx\cong\sim$	<code>\frownneq</code>	$\not\approx\cong\sim$	<code>\nsqdoublesmileeq</code>	\approx	<code>\sqdoublesmileeq</code>
$\approx\cong\sim\asymp$	<code>\frownneqsmile</code>	$\not\approx\cong\sim\asymp$	<code>\nsqeqfrown</code>	\approx	<code>\sqeqfrown</code>
$\approx\cong\sim\asymp\asymp$	<code>\frownsmile</code>	$\not\approx\cong\sim\asymp\asymp$	<code>\nsqeqsmile</code>	\approx	<code>\sqeqsmile</code>
$\approx\cong\sim\asymp\asymp\asymp$	<code>\frownsmileeq</code>	$\not\approx\cong\sim\asymp\asymp\asymp$	<code>\nsqfrown</code>	\approx	<code>\sqfrown</code>
$\not\approx$	<code>\ndoublefrown</code>	$\not\approx$	<code>\nsqfrownneq</code>	\approx	<code>\sqfrownneq</code>
$\not\approx$	<code>\ndoublefrownneq</code>	$\not\approx$	<code>\nsqfrownqsmile</code>	\approx	<code>\sqfrownneqsmile</code>
$\not\approx$	<code>\ndoublesmile</code>	$\not\approx$	<code>\nsqfrownsmile</code>	\approx	<code>\sqfrownsmile</code>
$\not\approx$	<code>\ndoublesmileeq</code>	$\not\approx$	<code>\nsqsmile</code>	\approx	<code>\sqsmile</code>
$\not\approx$	<code>\neqfrown</code>	$\not\approx$	<code>\nsqsmileeq</code>	\approx	<code>\sqsmileeq</code>
$\not\approx$	<code>\neqsmile</code>	$\not\approx$	<code>\nsqsmileeqfrown</code>	\approx	<code>\sqsmileeqfrown</code>
$\not\approx$	<code>\nfrown</code>	$\not\approx$	<code>\nsqsmilefrown</code>	\approx	<code>\sqsmilefrown</code>
$\not\approx$	<code>\nfrownneq</code>	$\not\approx$	<code>\nsqtriplefrown</code>	\approx	<code>\sqtriplefrown</code>
$\not\approx$	<code>\nfrownneqsmile</code>	$\not\approx$	<code>\nsqtriplesmile</code>	\approx	<code>\sqtriplesmile</code>
$\not\approx$	<code>\nfrownsmile</code>	$\not\approx$	<code>\ntriplefrown</code>	\approx	<code>\triplefrown</code>
$\not\approx$	<code>\nfrownsmileeq</code>	$\not\approx$	<code>\ntriplesmile</code>	\approx	<code>\triplesmile</code>
$\not\approx$	<code>\nsmile</code>	$\not\approx$	<code>\smile</code>	\approx	

* 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 123: ulsy Contradiction Symbols

\downarrow `\blitza` \downarrow `\blitzb` \downarrow `\blitzc` \downarrow `\blitzd` \downarrow `\blitze`

TABLE 124: Extension Characters

$-$ `\relbar` $=$ `\Relbar`

TABLE 125: stmaryrd Extension Characters

$/$ `\Arrownot` $:$ `\Mapsfromchar` $:$ `\Mapstochar`
 $/$ `\arrownot` $:$ `\mapsfromchar`

TABLE 126: txfonts/pxfonts Extension Characters

$:$ `\Mappedfromchar` $\#$ `\Mmappedfromchar` $\#$ `\Mmapstochar`
 $:$ `\mappedfromchar` $\#$ `\mmappedfromchar` $\#$ `\mmapstochar`

TABLE 127: `mathabx` Extension Characters

<code>\mapsfromchar</code>	<code>\mapstochar</code>
<code>\Mapsfromchar</code>	<code>\Mapstochar</code>

TABLE 128: Log-like Symbols

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

Calling the above “symbols” may be a bit misleading.³ Each log-like symbol merely produces the eponymous textual equivalent, but with proper surrounding spacing. See Section 8.4 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 L^AT_EX [Dow00] for samples.

TABLE 129: *AMS* Log-like Symbols

<code>inj lim</code>	<code>\injlim</code>	<code>\varinjlim</code>	<code>\varprojlim</code>	<code>\varlimsup</code>	<code>\varliminf</code>
<code>proj lim</code>	<code>\projlim</code>	<code>\varprojlim</code>	<code>\varinjlim</code>	<code>\varliminf</code>	<code>\varprojlim</code>

Load the `amsmath` package to get these symbols. See Section 8.4 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 L^AT_EX [Dow00] for samples.

TABLE 130: *QFNA2e* Number Sets

<code>C</code>	<code>\Complex</code>	<code>Z</code>	<code>\Integer</code>	<code>N</code>	<code>\Natural</code>	<code>Q</code>	<code>\Rational</code>	<code>R</code>	<code>\Real</code>
<code>C</code>	<code>\COMPLEX</code>	<code>Z</code>	<code>\INTEGER</code>	<code>N</code>	<code>\NATURAL</code>	<code>Q</code>	<code>\RATIONAL</code>	<code>R</code>	<code>\REAL</code>

³Michael J. Downes prefers the more general term, “atomic math objects”.

TABLE 131: Greek Letters

α	\alpha	θ	\theta	\circ	\circ	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 8.5 for examples of how to produce bold Greek letters.

The symbols in this table are intended to be used in mathematical typesetting. Greek body text can be typeset using the `babel` package’s `greek` (or `polutonikogreek`) option—and, of course, a font that provides the glyphs for the Greek alphabet.

TABLE 132: *AMS* Greek Letters

F \digamma \varkappa \varkappa

TABLE 133: *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 134: `upgreek` Upright Greek Letters

α	<code>\upalpha</code>	θ	<code>\uptheta</code>	π	<code>\uppi</code>	ϕ	<code>\upphi</code>
β	<code>\upbeta</code>	ϑ	<code>\upvartheta</code>	ϖ	<code>\upvarpi</code>	φ	<code>\upvarphi</code>
γ	<code>\upgamma</code>	ι	<code>\upiota</code>	ρ	<code>\uprho</code>	χ	<code>\upchi</code>
δ	<code>\updelta</code>	κ	<code>\upkappa</code>	\wp	<code>\upvarrho</code>	ψ	<code>\uppsi</code>
ϵ	<code>\upepsilon</code>	λ	<code>\uplambda</code>	σ	<code>\upsigma</code>	ω	<code>\upomega</code>
ε	<code>\upvarepsilon</code>	μ	<code>\upmu</code>	σ	<code>\upvarsigma</code>		
ζ	<code>\upzeta</code>	ν	<code>\upnu</code>	τ	<code>\uptau</code>		
η	<code>\upeta</code>	ξ	<code>\upxi</code>	υ	<code>\upupsilon</code>		
Γ	<code>\Upsilon</code>	Λ	<code>\Uplambda</code>	Σ	<code>\Upsilonigma</code>	Ψ	<code>\Uppsi</code>
Δ	<code>\Updelta</code>	Ξ	<code>\Upxi</code>	Υ	<code>\Upupsilon</code>	Ω	<code>\Upomega</code>
Θ	<code>\Uptheta</code>	Π	<code>\Uppi</code>	Φ	<code>\Upphi</code>		

`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, “ $\Gamma\Delta\Theta\alpha\beta\gamma$ ” (Symbol) with “ $\Gamma\Delta\Theta\alpha\beta\gamma$ ” (Euler).

TABLE 135: `fourier` Variant Greek Letters

π	<code>\pi</code>	ρ	<code>\rho</code>
ϖ	<code>\varpi</code>	ϱ	<code>\varrho</code>
\varvarpi	<code>\varvarpi</code>	\varvarrho	<code>\varvarrho</code>

TABLE 136: `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 137: `AMS` Hebrew Letters

\beth `\beth` \gimel \daleth `\daleth`

`\aleph` (\aleph_0) appears in Table 201 on page 65.

TABLE 138: `MnSymbol` Hebrew Letters

\aleph `\aleph` \beth `\beth` \gimel \daleth `\daleth`

TABLE 139: Letter-like Symbols

\bot	<code>\bot</code>	\forall	<code>\forall</code>	\imath	<code>\imath</code>	\ni	<code>\ni</code>	\top	<code>\top</code>
ℓ	<code>\ell</code>	\hbar	<code>\hbar</code>	\in	<code>\in</code>	∂	<code>\partial</code>	\wp	<code>\wp</code>
\exists	<code>\exists</code>	\Im	<code>\Im</code>	\jmath	<code>\jmath</code>	\jmath	<code>\jmath</code>	\Re	<code>\Re</code>

TABLE 140: *AMS* Letter-like Symbols

\mathbb{k}	<code>\Bbbk</code>	\complement	<code>\complement</code>	\hbar	<code>\hbar</code>
\mathbb{R}	<code>\circledR</code>	\exists	<code>\Finv</code>	\hbar	<code>\hslash</code>
\mathbb{S}	<code>\circledS</code>	\exists	<code>\Game</code>	\nexists	<code>\nexists</code>

TABLE 141: *txfonts/pxfonts* Letter-like Symbols

\mathfrak{c} `\mathfrak{mathcent}` \mathfrak{f} `\mathfrak{mathsterling}* \mathfrak{f} \mathfrak{notin} \mathfrak{f} \mathfrak{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 142: *mathabx* Letter-like Symbols

\in	<code>\barin</code>	\in	<code>\in</code>	$\not\top$	<code>\nottop</code>	\notin	<code>\varnotin</code>
\complement	<code>\complement</code>	\nexists	<code>\nexists</code>	\owns	<code>\owns</code>	$\not\owns$	<code>\varnotowns</code>
\exists	<code>\exists</code>	$\not\bot$	<code>\notbot</code>	\ownsbar	<code>\ownsbar</code>		
\exists	<code>\Finv</code>	\notin	<code>\notin</code>	∂	<code>\partial</code>	∂	<code>\partial</code>
\exists	<code>\Game</code>	$\not\owns$	<code>\notowns</code>	$\not\partial$	<code>\not\partial</code>	$\not\partial$	<code>\not\partial</code>

TABLE 143: *MnSymbol* Letter-like Symbols

\perp	<code>\bot</code>	\in	<code>\in</code>	$\not\owns^*$	<code>\notowns</code>	\top	<code>\top</code>
\exists	<code>\exists</code>	\nexists	<code>\nexists</code>	\owns	<code>\owns</code>	\wp	<code>\wp</code>
\forall	<code>\forall</code>	$\in \nexists^*$	<code>\in \nexists^*</code>	\wp	<code>\wp</code>	\wp	<code>\wp</code>

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

TABLE 144: *trfsigns* Letter-like Symbols

e `\e` j `\im`

TABLE 145: *mathdesign* Letter-like Symbols

\in	<code>\in</code>	\exists	<code>\owns</code>
\notin	<code>\notin</code>	\in	<code>\smallin</code>
\notin	<code>\notsmallin</code>	\exists	<code>\smallowns</code>
\notin	<code>\notsmallowns</code>		

The *mathdesign* package additionally provides versions of each of the letter-like symbols shown in Table 140.

TABLE 146: fge Letter-like Symbols

V	\fgeA	g	\fgeeszett	B	\fgeleftB	F	\fgeU
ß	\fgec	H	\fgefF	C	\fgeleftC		
p	\fged	Y	\fgef	E	\fgerightB		
ß	\fgee	ø	\fgelb*	f	\fges		

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

TABLE 147: fourier Letter-like Symbols

∂	\partial
∂	\varpartialdiff

TABLE 148: *AMS* Delimiters

[\ulcorner]	\urcorner
[\llcorner]	\lrcorner

TABLE 149: stmaryrd Delimiters

{	\Lbag	}	\Rbag	{	\lbag	}	\rbag
[\![\lceil]\!]	\rceil	[\![\lfloor]\!]	\rfloor
(\llparenthesis)	\rrparenthesis				

TABLE 150: mathabx Delimiters

[\lcorners]	\rcorners
[\ulcorner]	\urcorner
[\llcorner]	\lrcorner

TABLE 151: nath Delimiters

[\niv]	\vin
---	------	---	------

TABLE 152: Variable-sized Delimiters

\downarrow	\downarrow	\downarrow	\Downarrow	$[$	$[$	$]$	$]$	$]$
\langle	\langle	\rangle	\rangle	\lvert	\lvert	\lvert	\parallel	\parallel
\lceil	\lceil	\rceil	\rceil	\uparrow	\uparrow	\uparrow	\Uparrow	\Uparrow
\lfloor	\lfloor	\rfloor	\rfloor	\downarrow	\downarrow	\downarrow	\Updownarrow	\Updownarrow
$($	$($	$)$	$)$	$\{$	$\{$	$\}$	$\}$	$\}$
$/$	$/$	$/$	\backslash	\backslash	\backslash	\backslash	\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 153: Large, Variable-sized Delimiters

\int	\int	\int	\int	$\left($	$\left($	$\right)$	$\right)$	$\right)$
\mid	\mid	\mid	\mid	$\left\langle$	$\left\langle$	$\right\rangle$	$\right\rangle$	$\right\rangle$

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 154: \mathcal{AM} S Variable-sized Delimiters

\mid	\mid	\mid	\mid	\mid	\mid
\parallel	\parallel	\parallel	\parallel	\parallel	\parallel

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 152) are intended to be used as operators (e.g., as in “ $p|q$ ”).

 TABLE 155: `stmaryrd` Variable-sized Delimiters

\llbracket	\llbracket	\rrbracket	\rrbracket
--------------	--------------	--------------	--------------

TABLE 156: *mathabx* Variable-sized Delimiters

[[\ldbrack]]	\rdbrack
,	\lfilet	,	\rfilet
	\thickvert		\vvvert

TABLE 157: MnSymbol Variable-sized Delimiters

`\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 158: `mathdesign` Variable-sized Delimiters

$,$	$\left\{ \right\}$	<code>\leftwave</code>	$,$	$\left\} \right\}$	<code>\rightwave</code>
$,$	$\left\{ \right\}$	<code>\leftevaw</code>	$,$	$\left\} \right\}$	<code>\rightevaw</code>

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 159: `nath` Variable-sized Delimiters (Double)

$\langle\langle$	$\langle\langle$	<code>\lAngle</code>	$\rangle\rangle$	$\rangle\rangle$	<code>\rAngle</code>
\llbracket	\llbracket	<code>\lBrack</code>	\rrbracket	\rrbracket	<code>\rBrack</code>
\lceil	\lceil	<code>\lCeil</code>	\rceil	\rceil	<code>\rCeil</code>
\lfloor	\lfloor	<code>\lFloor</code>	\rfloor	\rfloor	<code>\rFloor</code>
\parallel	\parallel	<code>\lVert^*</code>	\parallel	\parallel	<code>\rVert^*</code>

* `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 159 can also be expressed using the `\double` macro. See the `nath` documentation for examples and additional information.

TABLE 160: `nath` Variable-sized Delimiters (Triple)

«	«	<code>\triple<</code>	»	»	<code>\triple></code>
[[<code>\triple[</code>]]	<code>\triple]</code>
		<code>\ltriple *</code>			<code>\rtriple *</code>

* Similar to `\lVert` and `\rVert` in Table 159, `\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 161: `fourier` Variable-sized Delimiters

[[<code>\llbracket</code>]]	<code>\rrbracket</code>
		<code>\VERT</code>			

TABLE 162: `textcomp` Text-mode Delimiters

⟨	<code>\textlangle</code>	⟩	<code>\textrangle</code>
[<code>\textlbrackdbl</code>]	<code>\textrbrackdbl</code>
{	<code>\textlquill</code>	}	<code>\textrquill</code>

TABLE 163: `metre` Text-mode Delimiters

}	<code>\alad</code>	}	<code>\Alad</code>	†	<code>\crux</code>	†	<code>\Crux</code>
{	<code>\alas</code>	{	<code>\Alas</code>]	<code>\quadrad</code>]	<code>\Quadrad</code>
⟩	<code>\angud</code>	⟩	<code>\Angud</code>	[<code>\quadras</code>	[<code>\Quaras</code>
⟨	<code>\angus</code>	⟨	<code>\Angus</code>				

TABLE 164: Math-mode Accents

á	<code>\acute{a}</code>	ă	<code>\check{a}</code>	à	<code>\grave{a}</code>	ã	<code>\tilde{a}</code>
ā	<code>\bar{a}</code>	ä	<code>\ddot{a}</code>	â	<code>\hat{a}</code>	ā	<code>\vec{a}</code>
ă	<code>\breve{a}</code>	å	<code>\dot{a}</code>	å	<code>\mathring{a}</code>		

Also note the existence of `\imath` and `\jmath`, which produce dotless versions of “*i*” and “*j*”. (See Table 201 on page 65.) These are useful when the accent is supposed to replace the dot. For example, “`\hat{\imath}\imath`” produces a correct “ \hat{i} ”, while “`\hat{\imath}\imath`” would yield the rather odd-looking “ $\hat{\hat{i}}$ ”.

TABLE 165: *AMS* Math-mode Accents
 \ddot{a} `\ddot{a}` $\ddot{\ddot{a}}$ `\ddot{\ddot{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 *AMS* ones tighten the space between the dots (from \ddot{a} to $\ddot{\ddot{a}}$). The `mathabx` and `mathdots` versions also function properly within subscripts and superscripts ($x^{\ddot{a}}$ instead of $x^{\ddot{\ddot{a}}}$).

TABLE 166: *MnSymbol* Math-mode Accents
 \vec{a} `\vec{a}`
TABLE 167: *fge* Math-mode Accents
 $\dot{\AA}$ `\dot{\AA}` $\dot{\dot{\AA}}$ `\dot{\dot{\AA}}`*
 $\dot{\dot{\AA}}$ `\dot{\dot{\AA}}` $\dot{\dot{\dot{\AA}}}$ `\dot{\dot{\dot{\AA}}}`

* When *fge* is passed the `crescent` option, `\spirituslenis` instead uses a crescent accent as in “ $\dot{\AA}$ ”.

TABLE 168: *yhmath* Math-mode Accents
 \aa `\aa`

This symbol is largely obsolete, as standard L^AT_EX 2 _{ε} has supported `\mathring{a}` since June, 1998 [LAT98].

TABLE 169: Extensible Accents

\widetilde{abc}	<code>\widetilde{abc}</code> *	\widehat{abc}	<code>\widehat{abc}</code> *
\overleftarrow{abc}	<code>\overleftarrow{abc}</code> †	\overrightarrow{abc}	<code>\overrightarrow{abc}</code> †
\overline{abc}	<code>\overline{abc}</code>	\underline{abc}	<code>\underline{abc}</code>
\overbrace{abc}	<code>\overbrace{abc}</code>	\underbrace{abc}	<code>\underbrace{abc}</code>
\sqrt{abc}	<code>\sqrt{abc}</code> ‡		

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., “ $x + \cancel{x}$ ” or “ $3 + \cancel{5}2$ ”) 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 170: `overrightarrow` Extensible Accents

$$\overrightarrow{\overrightarrow{abc}} \quad \text{\code{\overrightarrow{overrightarrow{abc}}}}$$

TABLE 171: `yhmath` Extensible Accents

\widehat{abc}	<code>\widehat{abc}</code>	\widehat{abc}	<code>\widehat{abc}</code>
$\overset{\circ}{abc}$	<code>\overset{\circ}{abc}</code>	$\overset{\circ}{abc}$	<code>\overset{\circ}{abc}</code>

TABLE 172: `AMS` Extensible Accents

\overleftrightarrow{abc}	<code>\overleftrightarrow{abc}</code>	\overleftarrow{abc}	<code>\overleftarrow{underleftarrow{abc}}</code>
\overleftarrow{abc}	<code>\overleftarrow{underleftarrow{abc}}</code>	\overrightarrow{abc}	<code>\overrightarrow{underrightarrow{abc}}</code>

TABLE 173: **MnSymbol** Extensible Accents

\overbrace{abc}	<code>\overbrace{abc}</code>	\underbrace{abc}	<code>\underbrace{abc}</code>
\overgroup{abc}	<code>\overgroup{abc}</code>	\undergroup{abc}	<code>\undergroup{abc}</code>
\overline{abc}	<code>\overline{abc}</code>	\underline{abc}	<code>\underline{abc}</code>
\overleftarrow{abc}	<code>\overleftarrow{abc}</code>	\overrightarrow{abc}	<code>\overrightarrow{abc}</code>
\widehat{abc}	<code>\widehat{abc}</code>	\widetilde{abc}	<code>\widetilde{abc}</code>
\wideparen{abc}	<code>\wideparen{abc}</code>		

TABLE 174: **mathtools** Extensible Accents

\overbrace{abc}	<code>\overbrace{abc}</code>	\underbrace{abc}	<code>\underbrace{abc}</code>
\overbracket{abc}	<code>\overbracket{abc}</code> *	\underbracket{abc}	<code>\underbracket{abc}</code> *

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

TABLE 175: **mathabx** Extensible Accents

\overbrace{abc}	<code>\overbrace{abc}</code>	\widebar{abc}	<code>\widebar{abc}</code>
\overgroup{abc}	<code>\overgroup{abc}</code>	\widecheck{abc}	<code>\widecheck{abc}</code>
\underbrace{abc}	<code>\underbrace{abc}</code>	\wideparen{abc}	<code>\wideparen{abc}</code>
\undergroup{abc}	<code>\undergroup{abc}</code>	\widecheck{abc}	<code>\widecheck{abc}</code>
\widearrow{abc}	<code>\widearrow{abc}</code>		

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

TABLE 176: **fourier** Extensible Accents

\widearc{abc}	<code>\widearc{abc}</code>	\wideparen{abc}	<code>\wideparen{abc}</code>
\wideOarc{abc}	<code>\wideOarc{abc}</code>	\widecheck{abc}	<code>\widecheck{abc}</code>

TABLE 177: esvect Extensible Accents

\overrightarrow{abc}	<code>\vv{abc}</code> with package option a
\overleftarrow{abc}	<code>\vv{abc}</code> with package option b
$\overrightarrow{\overrightarrow{abc}}$	<code>\vv{abc}</code> with package option c
$\overrightarrow{\overleftarrow{abc}}$	<code>\vv{abc}</code> with package option d
$\overleftarrow{\overrightarrow{abc}}$	<code>\vv{abc}</code> with package option e
$\overleftarrow{\overleftarrow{abc}}$	<code>\vv{abc}</code> with package option f
$\overrightarrow{\overleftarrow{\overrightarrow{abc}}}$	<code>\vv{abc}</code> with package option g
$\overrightarrow{\overleftarrow{\overleftarrow{abc}}}$	<code>\vv{abc}</code> 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 178: undertilde Extensible Accents

abc \utilde{abc}

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

TABLE 179: ushort Extensible Accents

abc \ushortdw{abc} abc \ushortw{abc}

`\ushortw` and `\ushortdw` are intended to be used with multi-character arguments (“words”) while `\ushort` and `\ushortd` are intended to be used with single-character arguments.

The underlines produced by the `ushort` commands are shorter than those produced by the `\underline` command. Consider the output from the expression “`\ushort{x}\ushort{y}\underline{x}\underline{y}`”, which looks like “*xyxy*”.

TABLE 180: *AMS* Extensible Arrows

\xleftarrow{abc} \xleftarrow{abc} \xrightarrow{abc} \xrightarrow{abc}

TABLE 181: mathtools Extensible Arrows

$\xleftarrow[abc]$	<code>\xhookleftarrow{abc}</code>	$\xleftarrow[abc]$	<code>\xleftrightharpoons{abc}</code>
$\xrightarrow[abc]$	<code>\xhookrightarrow{abc}</code>	$\xrightarrow[abc]$	<code>\xmapsto{abc}</code>
$\xLeftarrow[abc]$	<code>\xLeftarrow{abc}</code>	$\xRightarrow[abc]$	<code>\xRightarrow{abc}</code>
$\xleftrightharpoondown[abc]$	<code>\xleftrightharpoondown{abc}</code>	$\xleftrightharpoonup[abc]$	<code>\xleftrightharpoonup{abc}</code>
$\xleftrightharpoonup[abc]$	<code>\xleftrightharpoonup{abc}</code>	$\xrightleftharpoonup[abc]$	<code>\xrightleftharpoonup{abc}</code>
$\xleftrightharpoons[abc]$	<code>\xleftrightharpoons{abc}</code>	$\xrightleftharpoons[abc]$	<code>\xrightleftharpoons{abc}</code>
$\xLeftrightarrow[abc]$	<code>\xLeftrightarrow{abc}</code>		

TABLE 182: chemarr Extensible Arrows

$$\xrightleftharpoons[abc]{} \quad \text{\code{\xrightleftharpoons{abc}}}$$

TABLE 183: chemarrow Extensible Arrows

$\xleftarrow[abc]{def}$	<code>\autoleftarrow{abc}{def}</code>	$\xrightarrow[abc]{def}$	<code>\autorightarrow{abc}{def}</code>
$\xrightleftharpoons[abc]{def}$	<code>\autoleftrightharpoons{abc}{def}</code>	$\xrightleftharpoons[abc]{def}$	<code>\autorightleftharpoons{abc}{def}</code>

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 184: extarrows Extensible Arrows

$\xLeftrightarrow[abc]$	<code>\xLeftrightarrow{abc}</code>	$\xLongleftrightarrow[abc]$	<code>\xLongleftrightarrow{abc}</code>
$\xleftrightharpoons[abc]$	<code>\xleftrightharpoons{abc}</code>	$\xlongleftrightharpoons[abc]$	<code>\xlongleftrightharpoons{abc}</code>
$\xLongequal[abc]$	<code>\xLongequal{abc}</code>	$\xLongrightarrow[abc]$	<code>\xLongrightarrow{abc}</code>
$\xLongleftarrow[abc]$	<code>\xLongleftarrow{abc}</code>	$\xlongrightarrow[abc]$	<code>\xlongrightarrow{abc}</code>
$\xlongleftrightharpoons[abc]$	<code>\xlongleftrightharpoons{abc}</code>		

TABLE 185: `extpfeil` Extensible Arrows

$\frac{abc}{abc}$	<code>\xlongequal{abc}</code>	$\frac{abc}{abc}$	<code>\xmapsto{abc}</code>
\xleftarrow{abc}	<code>\xtwoheadleftarrow{abc}</code>	\xrightarrow{abc}	<code>\xtwoheadrightarrow{abc}</code>

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 186: `DotArrow` Extensible Arrows

$$\overset{a}{\cdots \rightarrow} \quad \text{\dotarrow{a}}$$

The `DotArrow` package provides mechanisms for lengthening the arrow, adjusting the distance between the arrow and its symbol, and altering the arrowhead. See the `DotArrow` documentation for more information.

TABLE 187: `trfsigns` Extensible Transform Symbols

$$\overleftarrow{a} \quad \text{\dft{a}} \quad \overrightarrow{a} \quad \text{\DFT{a}}$$

TABLE 188: `holtpolt` Non-commutative Division Symbols

$$\left[\begin{array}{c} abc \\ def \end{array} \right] \quad \text{\holter{abc}{def}} \quad \left[\begin{array}{c} abc \\ def \end{array} \right] \quad \text{\polter{abc}{def}}$$

TABLE 189: Dots

$$\cdot \quad \text{\cdotp} \quad : \quad \text{\colon}^* \quad . \quad \text{\ldotp} \quad \vdots \quad \text{\vdots} \quad \text{\vdots}^\dagger \\ \cdots \quad \text{\cdots} \quad \ddots \quad \text{\ddots}^\dagger \quad \ldots \quad \text{\ldots} \quad \vdots \quad \text{\vdots} \quad \text{\vdots}^\dagger$$

* While “:” is valid in math mode, `\colon` uses different surrounding spacing. See Section 8.4 and the Short Math Guide for L^AT_EX [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 L^AT_EX 2_E's `\ddots` and `\vdots` macros.

TABLE 190: *AMS* Dots

\because	<code>\because*</code>	\cdots	<code>\dotsi</code>	\therefore	<code>\therefore*</code>
\dots	<code>\dotsb</code>	\cdots	<code>\dotsm</code>		
\dots	<code>\dotsc</code>	\cdots	<code>\dotso</code>		

* `\because` and `\therefore` are defined as binary relations and therefore also appear in Table 68 on page 30.

The *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 191: *wasysym* Dots

\therefore `\wasytherefore`

TABLE 192: *MnSymbol* Dots

\cdot	<code>\cdot</code>	$\cdot\cdot$	<code>\cdot\cdot</code>	$\cdot\cdot\cdot$	<code>\cdot\cdot\cdot</code>
$\cdot\cdot$	<code>\cdot\cdot</code>	$\cdot\cdot\cdot$	<code>\cdot\cdot\cdot</code>	$\cdot\cdot\cdot\cdot$	<code>\cdot\cdot\cdot\cdot</code>
$\cdot\cdot\cdot$	<code>\cdot\cdot\cdot</code>	$\cdot\cdot\cdot\cdot$	<code>\cdot\cdot\cdot\cdot</code>	$\cdot\cdot\cdot\cdot\cdot$	<code>\cdot\cdot\cdot\cdot\cdot</code>
$\cdot\cdot\cdot\cdot$	<code>\cdot\cdot\cdot\cdot</code>	$\cdot\cdot\cdot\cdot\cdot$	<code>\cdot\cdot\cdot\cdot\cdot</code>	$\cdot\cdot\cdot\cdot\cdot\cdot$	<code>\cdot\cdot\cdot\cdot\cdot\cdot</code>
$\cdot\cdot\cdot\cdot\cdot$	<code>\cdot\cdot\cdot\cdot\cdot</code>	$\cdot\cdot\cdot\cdot\cdot\cdot$	<code>\cdot\cdot\cdot\cdot\cdot\cdot</code>	$\cdot\cdot\cdot\cdot\cdot\cdot\cdot$	<code>\cdot\cdot\cdot\cdot\cdot\cdot\cdot</code>

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

All of the above except `\cdot\cdot\cdot` and `\cdot\cdot\cdot\cdot` are defined as binary operators and therefore also appear in Table 50 on page 23. 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 193: *mathdots* Dots

\cdots `\iddots`

TABLE 194: *yhmath* Dots

\cdots `\adots`

TABLE 195: *teubner* Dots

$:$ `\:` \vdots `\;` \ddots `\?` \ddots `\antilabe`

TABLE 196: *mathcomp* Math Symbols

$^{\circ}\text{C}$	<code>\tccentigrade</code>	Ω	<code>\tcohm</code>	$\%$	<code>\tcporthousand</code>
μ	<code>\tcmu</code>	$\%$	<code>\tcpertenthousand</code>		

TABLE 197: *marvosym* Digits

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

TABLE 198: *fge* Digits

0 `\fgestruckzero` 1 `\fgestruckone`

TABLE 199: dozenal Base-12 Digits

3 `\x` E `\e`

TABLE 200: *mathabx* Mayan Digits

\oplus	<code>\maya{0}</code>	:	<code>\maya{2}</code>	:	<code>\maya{4}</code>
.	<code>\maya{1}</code>	:	<code>\maya{3}</code>		<code>\maya{5}</code>

TABLE 201: Miscellaneous L^AT_EX 2_ε Math Symbols

\aleph	<code>\aleph</code>	\diamond	<code>\Diamond*</code>	∞	<code>\infty</code>	/	<code>\prime</code>
\angle	<code>\angle</code>	\diamondsuit	<code>\diamondsuit</code>	\mho	<code>\mho</code>	#	<code>\sharp</code>
\backslash	<code>\backslash</code>	\emptyset	<code>\emptyset</code>	∇	<code>\nabla</code>	♠	<code>\spadesuit</code>
\Box	<code>\Box</code>	\flat	<code>\flat</code>	\natural	<code>\natural</code>	✓	<code>\surd</code>
♣	<code>\clubsuit</code>	\heartsuit	<code>\heartsuit</code>	¬	<code>\neg</code>	△	<code>\triangle</code>

* Not predefined in L^AT_EX 2_ε. 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 *AMS*’s `\varnothing` (“∅”, Table 202) to that of L^AT_EX’s `\emptyset`.

TABLE 202: Miscellaneous *AMS* Math Symbols

\angle	<code>\angle</code>	\blacktriangledown	<code>\blacktriangledown</code>	\mho	<code>\mho</code>
\backprime	<code>\backprime</code>	\diagdown	<code>\diagdown</code>	\sphericalangle	<code>\sphericalangle</code>
\bigstar	<code>\bigstar</code>	\diagup	<code>\diagup</code>	\square	<code>\square</code>
\blacklozenge	<code>\blacklozenge</code>	\eth	<code>\eth</code>	\triangledown	<code>\triangledown</code>
\blacksquare	<code>\blacksquare</code>	\lozenge	<code>\lozenge</code>	\varnothing	<code>\varnothing</code>
\blacktriangle	<code>\blacktriangle</code>	\measuredangle	<code>\measuredangle</code>	\vartriangle	<code>\vartriangle</code>

TABLE 203: Miscellaneous *wasysym* Math Symbols

\Box	<code>\Box</code>	\Diamond	<code>\Diamond</code>	\mho^*	<code>\mho^*</code>	\varangle	<code>\varangle</code>
--------	-------------------	------------	-----------------------	----------	---------------------	-------------	------------------------

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

TABLE 204: Miscellaneous *txfonts/pffonts* Math Symbols

\blacklozenge	<code>\Diamondblack</code>	λ	<code>\lambdaslash</code>	\heartsuit	<code>\varheartsuit</code>
\lozenge	<code>\Diamonddot</code>	\wp	<code>\varclubsuit</code>	\spadesuit	<code>\varspadesuit</code>
λ	<code>\lambda</code>	\blacklozenge	<code>\vardiamondsuit</code>		

TABLE 205: Miscellaneous *mathabx* Math Symbols

\circ	<code>\degree</code>	$\#/\#$	<code>\fourth</code>	$\not\equiv$	<code>\measuredangle</code>	$//$	<code>\second</code>
\backslash	<code>\diagdown</code>	#	<code>\hash</code>	\pitchfork	<code>\pitchfork</code>	$\not\propto$	<code>\sphericalangle</code>
$/$	<code>\diagup</code>	∞	<code>\infty</code>	\propto	<code>\propto</code>	$///$	<code>\third</code>
\emptyset	<code>\diameter</code>	\times	<code>\leftthreetimes</code>	\times	<code>\rightthreetimes</code>	$\#$	<code>\varhash</code>

TABLE 206: Miscellaneous *MnSymbol* Math Symbols

\angle	<code>\angle</code>	\diamond	<code>\diamondsuit</code>	\maltese	<code>\maltese</code>	\sharp	<code>\sharp</code>
\neg	<code>\backneg</code>	\flat	<code>\flat</code>	\measuredangle	<code>\measuredangle</code>	\smallint	<code>\smallint</code>
\backprime	<code>\backprime</code>	\heartsuit	<code>\heartsuit</code>	∇	<code>\nabla</code>	\spadesuit	<code>\spadesuit</code>
\checkmark	<code>\checkmark</code>	∞	<code>\infty</code>	\natural	<code>\natural</code>	\sphericalangle	<code>\sphericalangle</code>
\clubsuit	<code>\clubsuit</code>	\neg	<code>\invbackneg</code>	\neg	<code>\neg</code>		
\emptyset	<code>\diameter</code>	\neg	<code>\invneg</code>	$'$	<code>\prime</code>		

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 207: Miscellaneous Internal MnSymbol Math Symbols

...	\partialvardint	...	\partialvartint
\cup	\partialvardlanddownint	\cup	\partialvartlanddownint
\cap	\partialvardlandupint	\cap	\partialvartlandupint
\circlearrowleft	\partialvardlcircleleftint	\circlearrowleft	\partialvartlcircleleftint
\circlearrowright	\partialvardlcirclerightint	\circlearrowright	\partialvartlcirclerightint
\circleddash	\partialvardoint	\circleddash	\partialvartooint
\circleddot	\partialvardpoint	\circleddot	\partialvartoint
\circlearrowleft	\partialvardrcircleleftint	\circlearrowleft	\partialvartrccircleleftint
\circlearrowright	\partialvardrcirclerightint	\circlearrowright	\partialvartrccirclerightint
\dashv	\partialvardstrokedint	\dashv	\partialvartstrokedint
\sum	\partialvardsumint	\sum	\partialvartsumint

These symbols are intended to be used internally by `MnSymbol` to construct the integrals appearing in Table 64 on page 29 but can nevertheless be used in isolation.

TABLE 208: Miscellaneous `textcomp` Text-mode Math Symbols

\textdegree*	\textonehalf†	\textthreequarters†
\textdiv	\textonequarter†	\textthreesuperior
\textfractionsolidus	\textonesuperior	\texttimes
\textlnot	\textpm	\texttwosuperior
\textminus	\textsurd	

* If you prefer a larger degree symbol you might consider defining one as “`\ensuremath{\wedge \circ}`” (“`°`”).

† `nicefrac` (part of the `units` package) or the newer `xfrac` package can be used to construct vulgar fractions like “ $1/2$ ”, “ $1/4$ ”, “ $3/4$ ”, and even “ c/o ”.

TABLE 209: Miscellaneous `marvosym` Math Symbols

\Angle	\Anglesign	\cdot	\Squaredot	\rightarrow	\Vectorarrowhigh
\Corresponds	\Corresponds	\rightarrow	\Vectorarrow		

TABLE 210: Miscellaneous `fge` Math Symbols

\fgebackslash	\fgebackslash	\fgecap	\fgecupacute	\fgecupacute	\fgelangle
\fgebaracute	\fgebaracute	\fgebaracute	\fgecupbar	\fgecupbar	\fgeupbracket
\fgebarcap	\fgebarcap	\fgebarcap	\fgecup	\fgecup	\fgeinfty

TABLE 211: Miscellaneous `mathdesign` Math Symbols

\rightangle

TABLE 212: Miscellaneous `arev` Math Symbols

\steaming	\steaming	\vardiamond	\vardiamond	\varspade
\varclub	\varclub	\varheart	\varheart	

TABLE 213: Math Alphabets

Font sample	Generating command	Required package
ABCdef123	<code>\mathrm{ABCdef123}</code>	<i>none</i>
<i>ABCdef123</i>	<code>\mathit{ABCdef123}</code>	<i>none</i>
<i>ABCdef123</i>	<code>\mathnormal{ABCdef123}</code>	<i>none</i>
<i>ABC</i>	<code>\mathcal{ABC}</code>	<i>none</i>
<i>A^BC</i>	<code>\mathscr{ABC}</code> <i>or</i> <code>\mathcal{ABC}</code>	<code>mathrsfs</code> <code>calrsfs</code>
<i>ABC</i>	<code>\mathcal{ABC}</code> <i>or</i> <code>\mathscr{ABC}</code>	<code>euscript</code> with the <code>mathcal</code> option <code>euscript</code> with the <code>mathscr</code> option
<i>ABCdef123</i>	<code>\mathpzc{ABCdef123}</code>	<i>none</i> ; manually defined*
<i>ABC</i>	<code>\mathbb{ABC}</code>	<code>amsfonts</code> , [§] <code>amssymb</code> , <code>txfonts</code> , or <code>pxfonts</code>
<i>ABC</i>	<code>\varmathbb{ABC}</code>	<code>txfonts</code> or <code>pxfonts</code>
ABCdef123	<code>\mathbb{ABCdef123}</code>	<code>bbold</code> or <code>mathbbol</code> [†]
ABCdef123	<code>\mathbb{ABCdef123}</code>	<code>mbboard</code> [†]
ABCdef12	<code>\mathbbm{ABCdef12}</code>	<code>bbm</code>
ABCdef12	<code>\mathbbmss{ABCdef12}</code>	<code>bbm</code>
ABCdef12	<code>\mathbbmtt{ABCdef12}</code>	<code>bbm</code>
ABC1	<code>\mathds{ABC1}</code>	<code>dsfont</code>
A ^B C1	<code>\mathds{ABC1}</code>	<code>dsfont</code> with the <code>sans</code> option
ABC	<code>\symA\symB\symC</code>	<code>china2e</code> [‡]
A ^B Cdef123	<code>\mathfrak{ABCdef123}</code>	<code>eufrak</code>
A ^B Cdef123	<code>\textfrak{ABCdef123}</code>	<code>yfonts</code> [¶]
A ^B Cdef123	<code>\textswab{ABCdef123}</code>	<code>yfonts</code> [¶]
A ^B Cdef123	<code>\textgoth{ABCdef123}</code>	<code>yfonts</code> [¶]

* 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 “*z*” (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, “`<[(\alpha\beta)]>`” 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` (“ ∇ ”)—but also *all* punctuation marks, various currency symbols such as `\bbdollar` (“\$”) and `\bbeuro` (“€”), and the Hebrew alphabet (e.g., “`\bbfinalnun\bbyod\bbqof\bbpe`” → “ $\aleph\eth\daleth$ ”).

‡ The `\sym...` commands provided by the `GiNA2e` package are actually text-mode commands. They are included in Table 213 because they resemble the blackboard-bold symbols that appear in the rest of the table. In addition to the 26 letters of the English alphabet, `GiNA2e` provides three umlauted blackboard-bold letters: `\symAE` (“ \ddot{A} ”), `\symOE` (“ \ddot{O} ”), and `\symUE` (“ \ddot{U} ”). Note that `GiNA2e` does provide math-mode commands for the most common number-set symbols. These are presented in Table 130 on page 49.

[¶] As their `\text... names imply, the fonts provided by the yfonts package are actually text fonts. They are included in Table 213 because they are frequently used in a mathematical context.`

[§] An older (i.e., prior to 1991) version of the *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 *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 L^AT_EX 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 214: `gensymb` Symbols Defined to Work in Both Math and Text Mode

$^{\circ}\text{C}$	<code>\celsius</code>	μ	<code>\micro</code>	$\%$	<code>\perthousand</code>
$^{\circ}$	<code>\degree</code>	Ω	<code>\ohm</code>		

TABLE 215: `wasy sym` Electrical and Physical Symbols

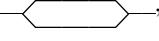
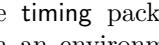
\sim	<code>\AC</code>	\approx	<code>\VHF</code>	$\sim\sim\sim$	<code>\photon</code>	F	<code>\HF</code>	$\sim\sim\sim\sim$	<code>\gluon</code>
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TABLE 216: `ifsym` Pulse Diagram Symbols

\sqcup	<code>\FallingEdge</code>	$\sqcup\sqcup$	<code>\LongPulseLow</code>	$\sqcup\sqcup\sqcup$	<code>\PulseLow</code>	$\sqcup\sqcup\sqcup\sqcup$	<code>\ShortPulseHigh</code>
$\sqcup\sqcup$	<code>\LongPulseHigh</code>	$\sqcup\sqcup\sqcup$	<code>\PulseHigh</code>	$\sqcup\sqcup\sqcup\sqcup\sqcup$	<code>\RaisingEdge</code>	$\sqcup\sqcup\sqcup\sqcup\sqcup\sqcup$	<code>\ShortPulseLow</code>

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

$-$	<code>l</code>	$-$	<code>m</code>	$-$	<code>h</code>	$-$	<code>d</code>	$<$	<code><</code>	$>$	<code>></code>
$--$	<code>L</code>	$--$	<code>M</code>	$--$	<code>H</code>	$--$	<code>D</code>	$<$	<code><<</code>	$>$	<code>>></code>

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 “`B`”.

TABLE 217: `ar` Aspect Ratio Symbol

\mathcal{R} `\AR`

TABLE 218: `textcomp` Text-mode Science and Engineering Symbols

$^{\circ}\text{C}$	<code>\textcelsius</code>	\textcirc	<code>\textmho</code>	μ	<code>\textmu</code>	Ω	<code>\textohm</code>
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TABLE 219: `steinmetz` Extensible Phasor Symbol

\underline{abc} `\phase{abc}`

The `\phase` command uses the `pict2e` package to draw a horizontally and vertically scalable Steinmetz phasor symbol. Consequently, `\phase` works only with those TeX backends supported by `pict2e`. See the `pict2e` documentation for more information.

TABLE 220: *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 221: *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 222: *mathabx* Astronomical Symbols

♀	\Mercury	⊕	\Earth	♃	\Jupiter	♂	\Uranus	♄	\Pluto
♀	\Venus	♂	\Mars	♁	\Saturn	♀	\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 223: *wasysym* APL Symbols

□	\APLbox	◻	\APLinv	*	\APLstar
⍳	\APLcomment	⍷	\APLleftarrowbox	△	\APLup
▽	\APLdown	⍥	\APLlog	⊤	\APLuparrowbox
⍢	\APLdownarrowbox	⊖	\APLminus	⌿	\notbackslash
⍢	\APLinput	⍥	\APLrightarrowbox	⌿	\notslash

TABLE 224: *wasysym* APL Modifiers

○	\APLcirc{}	~	\APLnot{}		\APLvert{}
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TABLE 225: marvosym Computer Hardware Symbols

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

TABLE 226: keystroke Computer Keys

	\Alt		\Enter*		\PrtSc*
	\AltGr		\Esc*		\RArrow
	\Break*		\Home*		\Return
	\BSpace†		\Ins*		\Scroll*
	\Ctrl*		\LArrow		\Shift*
	\DArrow		\NumLock		\Spacebar
	\Del*		\PgDown*		\Tab†
	\End*		\PgUp*		\UArrow

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

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

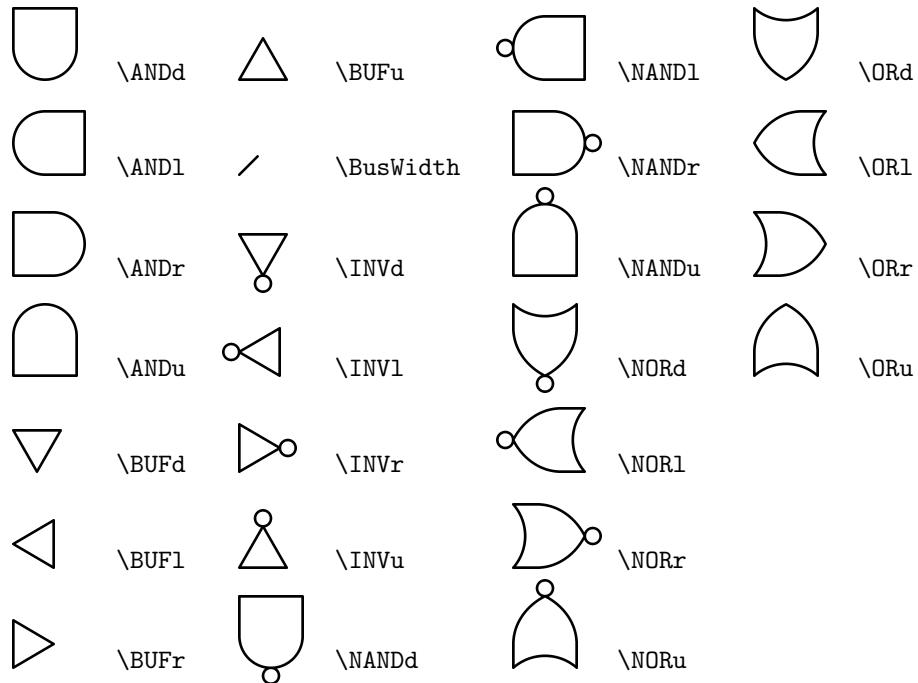
The `\keystroke` command draws a key with an arbitrary label. For example, “`\keystroke{F7}`” produces “”.

TABLE 227: 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 228: milstd Logic Gates



The `milstd` package, which provides the digital logic-gate symbols specified by the U.S. Department of Defense's MIL-STD-806 standard, was written as a `LATEX 2.09 .tex` file, not as a `LATEX 2ε` package. Consequently, it must be loaded into a document with `\input milstd`, not with the more modern `\usepackage{milstd}`.

TABLE 229: marvosym Communication Symbols

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

TABLE 230: marvosym Engineering Symbols

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

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

TABLE 231: wasysym Biological Symbols

	\female		\male
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TABLE 232: marvosym Biological Symbols

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

TABLE 233: marvosym Safety-related Symbols

	\Biohazard		\CEsign		\Explosionsafe		\Radioactivity
	\BSEfree		\Estatically		\Laserbeam		\Stopsign

TABLE 234: feyn Feynman Diagram Symbols

	\bigbosonloop		\hfermion		\smallbosonloopV
	\bigbosonloopA		\shfermion		\wfermion
	\bigbosonloopV		\smallbosonloop		\whfermion
	\gvcropped		\smallbosonloopA		
	\feyn{a}		\feyn{fu}		\feyn{glS}
	\feyn{c}		\feyn{fv}		\feyn{glu}
	\feyn{f}		\feyn{g}		\feyn{gu}
	\feyn{fd}		\feyn{g1}		\feyn{gv}
	\feyn{fl}		\feyn{gd}		\feyn{gvs}
	\feyn{flS}		\feyn{g1}		\feyn{h}
	\feyn{fs}		\feyn{glB}		\feyn{hd}
					\feyn{p}
					\feyn{P}
					\feyn{x}

All other arguments to the `\feyn` command produce a “

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 L^AT_EX 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 235: bbding Arrows

	\ArrowBoldDownRight		\ArrowBoldRightShort		\ArrowBoldUpRight
	\ArrowBoldRightCircled		\ArrowBoldRightStrobe		

TABLE 236: 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 237: universal Arrows

	\bauarrow		\bauwhitearrow
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TABLE 238: marvosym Scissors

	\Cutleft		\Cutright		\Leftscissors
	\Cutline		\Kutline		\Rightscissors

TABLE 239: bbding Scissors

	\ScissorHollowLeft		\ScissorLeftBrokenTop
	\ScissorHollowRight		\ScissorRight
	\ScissorLeft		\ScissorRightBrokenBottom
	\ScissorLeftBrokenBottom		\ScissorRightBrokenTop

TABLE 240: pifont Scissors

	\ding{33}		\ding{34}		\ding{35}		\ding{36}
--	-----------	--	-----------	--	-----------	--	-----------

TABLE 241: dingbat Pencils



TABLE 242: bbding Pencils and Nibs

↶	\NibLeft	↶	\PencilLeft	↶	\PencilRightDown
↷	\NibRight	↷	\PencilLeftDown	↷	\PencilRightUp
↶•	\NibSolidLeft	↷•	\PencilLeftUp		
↷•	\NibSolidRight	↷•	\PencilRight		

TABLE 243: pifont Pencils and Nibs

↶ \ding{46} ↷ \ding{47} ↶ \ding{48} ↸ \ding{49} ↹ \ding{50}

TABLE 244: dingbat Fists

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

TABLE 245: bbding Fists

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

TABLE 246: pifont Fists

⌚ \ding{42} ⌚ \ding{43} ☈ \ding{44} ☉ \ding{45}

TABLE 247: fourier Fists

⌚ \lefthand ☈ \righthand

TABLE 248: bbding Crosses and Plusses

✚	\Cross	✚	\CrossOpenShadow	✚	\PlusOutline
✚	\CrossBoldOutline	✚	\CrossOutline	✚	\PlusThinCenterOpen
❖	\CrossClowerTips	❖	\Plus		
❖	\CrossMaltese	❖	\PlusCenterOpen		

TABLE 249: pifont Crosses and Plusses

\oplus	<code>\ding{57}</code>	\oplus	<code>\ding{59}</code>	\dagger	<code>\ding{61}</code>	\ddagger	<code>\ding{63}</code>
\clubsuit	<code>\ding{58}</code>	\clubsuit	<code>\ding{60}</code>	\ddagger	<code>\ding{62}</code>	\ddagger	<code>\ding{64}</code>

TABLE 250: bbding Xs and Check Marks

\checkmark	<code>\Checkmark</code>	\times	<code>\XSolid</code>	\times	<code>\XSolidBrush</code>
\checkmark	<code>\CheckmarkBold</code>	\times	<code>\XSolidBold</code>		

TABLE 251: pifont Xs and Check Marks

\checkmark	<code>\ding{51}</code>	\times	<code>\ding{53}</code>	\times	<code>\ding{55}</code>
\checkmark	<code>\ding{52}</code>	\times	<code>\ding{54}</code>	\times	<code>\ding{56}</code>

TABLE 252: wasysym Xs and Check Marks

\square	<code>\CheckedBox</code>	\square	<code>\Square</code>	\square	<code>\XBox</code>
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TABLE 253: universal Xs

\times	<code>\baucross</code>
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TABLE 254: pifont Circled Numbers

$\textcircled{1}$	<code>\ding{172}</code>	$\textcircled{1}$	<code>\ding{182}</code>	$\textcircled{1}$	<code>\ding{192}</code>	$\textcircled{1}$	<code>\ding{202}</code>
$\textcircled{2}$	<code>\ding{173}</code>	$\textcircled{2}$	<code>\ding{183}</code>	$\textcircled{2}$	<code>\ding{193}</code>	$\textcircled{2}$	<code>\ding{203}</code>
$\textcircled{3}$	<code>\ding{174}</code>	$\textcircled{3}$	<code>\ding{184}</code>	$\textcircled{3}$	<code>\ding{194}</code>	$\textcircled{3}$	<code>\ding{204}</code>
$\textcircled{4}$	<code>\ding{175}</code>	$\textcircled{4}$	<code>\ding{185}</code>	$\textcircled{4}$	<code>\ding{195}</code>	$\textcircled{4}$	<code>\ding{205}</code>
$\textcircled{5}$	<code>\ding{176}</code>	$\textcircled{5}$	<code>\ding{186}</code>	$\textcircled{5}$	<code>\ding{196}</code>	$\textcircled{5}$	<code>\ding{206}</code>
$\textcircled{6}$	<code>\ding{177}</code>	$\textcircled{6}$	<code>\ding{187}</code>	$\textcircled{6}$	<code>\ding{197}</code>	$\textcircled{6}$	<code>\ding{207}</code>
$\textcircled{7}$	<code>\ding{178}</code>	$\textcircled{7}$	<code>\ding{188}</code>	$\textcircled{7}$	<code>\ding{198}</code>	$\textcircled{7}$	<code>\ding{208}</code>
$\textcircled{8}$	<code>\ding{179}</code>	$\textcircled{8}$	<code>\ding{189}</code>	$\textcircled{8}$	<code>\ding{199}</code>	$\textcircled{8}$	<code>\ding{209}</code>
$\textcircled{9}$	<code>\ding{180}</code>	$\textcircled{9}$	<code>\ding{190}</code>	$\textcircled{9}$	<code>\ding{200}</code>	$\textcircled{9}$	<code>\ding{210}</code>
$\textcircled{10}$	<code>\ding{181}</code>	$\textcircled{10}$	<code>\ding{191}</code>	$\textcircled{10}$	<code>\ding{201}</code>	$\textcircled{10}$	<code>\ding{211}</code>

pifont (part of the `psnfss` package) provides a `dingautolist` environment which resembles `enumerate` but uses circled numbers as bullets.⁴ See the `psnfss` documentation for more information.

TABLE 255: wasysym Stars

\diamond	<code>\davidsstar</code>	$*$	<code>\hexstar</code>	$*$	<code>\varhexstar</code>
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⁴In fact, `dingautolist` can use any set of consecutive Zapf Dingbats symbols.

TABLE 256: bbdng 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		\FourCloverOpen		\SnowflakeChevronBold
	\EightStarConvex		\FourCloverSolid		\Sparkle
	\EightStarTaper		\FourStar		\SparkleBold
	\FiveFlowerOpen		\FourStarOpen		\TwelweStar

TABLE 257: 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 258: fourier Ornaments

	\aldine		\decoone		\floweronright
	\aldineleft		\decosix		\leafleft
	\aldineright		\decothreeleft		\leafNE
	\aldinesmall		\decothreeright		\leafright
	\decfourleft		\decotwo		\starredbullet
	\decfourright		\floweroneleft		

TABLE 259: wasysym Geometric Shapes

○ \hexagon ○ \octagon □ \pentagon ○ \varhexagon

TABLE 260: MnSymbol Geometric Shapes

\star	<code>\filledlargestar</code>	\diamondsuit	<code>\largediamond</code>	$\star\!\!\star$	<code>\largestar</code>	\diamond	<code>\smalllozenge</code>
\blacklozenge	<code>\filledlozenge</code>	\lozenge	<code>\largeclozenge</code>	$\star\!\!\star$	<code>\largestarofdavid</code>	\lozenge	<code>\medlozenge</code>
\blacklozenge	<code>\filledmedlozenge</code>	$\star\!\!\star$	<code>\largepentagram</code>	\diamond	<code>\medlozenge</code>		
\largecircle	<code>\largecircle</code>	\square	<code>\largegesquare</code>	$\diamond\!\!\diamond$	<code>\medstarofdavid</code>		

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 261: ifsym Geometric Shapes

\bigcirc	<code>\BigCircle</code>	\blacktriangleright	<code>\FilledBigTriangleRight</code>	\bigcirc	<code>\SmallCircle</code>
\bigtimes	<code>\BigCross</code>	\blacktriangleup	<code>\FilledBigTriangleUp</code>	\times	<code>\SmallCross</code>
\blacklozenge	<code>\BigDiamondshape</code>	\bullet	<code>\FilledCircle</code>	\diamond	<code>\SmallDiamondshape</code>
$\bar{}$	<code>\BigHBar</code>	\blacklozenge	<code>\FilledDiamondShadowA</code>	$\bar{}$	<code>\SmallHBar</code>
\blacklozenge	<code>\BigLowerDiamond</code>	\blacklozenge	<code>\FilledDiamondShadowC</code>	\blacklozenge	<code>\SmallLowerDiamond</code>
\blacklozenge	<code>\BigRightDiamond</code>	\blacklozenge	<code>\FilledDiamondshape</code>	\blacklozenge	<code>\SmallRightDiamond</code>
\square	<code>\BigSquare</code>	\bullet	<code>\FilledSmallCircle</code>	\square	<code>\SmallSquare</code>
\blacktriangledown	<code>\BigTriangleDown</code>	\bullet	<code>\FilledSmallDiamondshape</code>	\blacktriangledown	<code>\SmallTriangleDown</code>
\blacktriangleleft	<code>\BigTriangleLeft</code>	\blacksquare	<code>\FilledSmallSquare</code>	\blacktriangleleft	<code>\SmallTriangleLeft</code>
\blacktriangleright	<code>\BigTriangleRight</code>	\blacktriangledown	<code>\FilledSmallTriangleDown</code>	\blacktriangleright	<code>\SmallTriangleRight</code>
\blacktriangleup	<code>\BigTriangleUp</code>	\blacktriangleleft	<code>\FilledSmallTriangleLeft</code>	\blacktriangleup	<code>\SmallTriangleUp</code>
\mid	<code>\BigVBar</code>	\blacktriangleright	<code>\FilledSmallTriangleRight</code>	\mid	<code>\SmallVBar</code>
\bigcirc	<code>\Circle</code>	\blacktriangleup	<code>\FilledSmallTriangleUp</code>	\downarrow	<code>\SpinDown</code>
\bigtimes	<code>\Cross</code>	\blacksquare	<code>\FilledSquare</code>	\uparrow	<code>\SpinUp</code>
\blacklozenge	<code>\DiamondShadowA</code>	\blacksquare	<code>\FilledSquareShadowA</code>	\square	<code>\Square</code>
\blacklozenge	<code>\DiamondShadowB</code>	\blacksquare	<code>\FilledSquareShadowC</code>	\square	<code>\SquareShadowA</code>
\blacklozenge	<code>\DiamondShadowC</code>	\blacktriangledown	<code>\FilledTriangleDown</code>	\square	<code>\SquareShadowB</code>
\blacklozenge	<code>\Diamondshape</code>	\blacktriangleleft	<code>\FilledTriangleLeft</code>	\square	<code>\SquareShadowC</code>
\bullet	<code>\FilledBigCircle</code>	\blacktriangleright	<code>\FilledTriangleRight</code>	\blacktriangledown	<code>\TriangleDown</code>
\blacklozenge	<code>\FilledBigDiamondshape</code>	\blacktriangleup	<code>\FilledTriangleUp</code>	\blacktriangleleft	<code>\TriangleLeft</code>
\blacksquare	<code>\FilledBigSquare</code>	$\bar{}$	<code>\HBar</code>	\blacktriangleright	<code>\TriangleRight</code>
\blacktriangledown	<code>\FilledBigTriangleDown</code>	\blacklozenge	<code>\LowerDiamond</code>	\blacktriangleup	<code>\TriangleUp</code>
\blacktriangleleft	<code>\FilledBigTriangleLeft</code>	\blacklozenge	<code>\RightDiamond</code>	\mid	<code>\VBar</code>

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 “ $\bigcirc\!\!\bullet$ ”. Likewise, `\Square` and `\Cross` combine to give “ $\bigtimes\!\!\square$ ”. See Section 8.3 for more information about constructing new symbols out of existing symbols.

TABLE 262: *bding* Geometric Shapes

○	\CircleShadow		\Rectangle	□	\SquareShadowTopLeft
●	\CircleSolid	█	\RectangleBold	□	\SquareShadowTopRight
◆	\DiamondSolid		\RectangleThin	█	\SquareSolid
○	\Ellipse	□	\Square	▼	\TriangleDown
○	\EllipseShadow	□	\SquareCastShadowBottomRight	▲	\TriangleUp
●	\EllipseSolid	□	\SquareCastShadowTopLeft		
●	\HalfCircleLeft	□	\SquareCastShadowTopRight		
●	\HalfCircleRight	□	\SquareShadowBottomRight		

TABLE 263: *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 264: *universa* Geometric Shapes

●	\baucircle	■	\bausquare	▲	\bautriangle
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TABLE 265: *universal* Geometric Shapes

○	\baucircle	●	\bauhole	■	\bausquare
●	\baueclipse	●	\baupunct	▲	\bautriangle

TABLE 266: Miscellaneous *dingbat* Dingbats

†	\anchor	👁	\eye	☒	\Sborder
▷	\carriagereturn	❖	\filledsquarewithdots	❖	\squarewithdots
✓	\checkmark	🌙	\satellitedish	☒	\Zborder

TABLE 267: Miscellaneous *bding* Dingbats

✉	\Envelope	✉	\Peace	📞	\PhoneHandset	☀	\SunshineOpenCircled
❖	\OrnamentDiamondSolid	☎	\Phone	✈	\Plane	⌚	\Tape

TABLE 268: 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 Ancient languages

This section presents letters and ideograms from various ancient scripts. Some of these symbols may also be useful in other typesetting contexts.

TABLE 269: 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		\PHtrainer
	\PHchild		\PHmanacles		\PHtattooedHead
	\PHclub		\PHmattock		\PHtiara
	\PHcolumn		\PHoxBack		\PHtunny
	\PHcomb		\PHpapyrus		\PHvine
	\PHdolium		\PHpedestrian		\PHwavyBand
	\PHdove		\PHplaneTree		\PHwoman

TABLE 270: protosem Proto-Semitic Characters

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

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 “`𠁠𠁤𠁥𠁧𠁩`”). See the `protosem` documentation for more information.

TABLE 271: hierogl Hieroglyphics

—	\HA	𓁈	\HI	𠁻	\Hn	𠁻	\HT
𓅓	\Ha	𓁉	\Hi	𠁽	\HO	𠁽	\Ht
𓅓	\HB	𓁊	\Hibl	𠁾	\Ho	𠁾	\Htongue
𓅓	\Hb	𓁋	\Hibp	𠁷	\Hp	𠁷	\HU
𓁌	\Hc	𓁌	\Hibs	𠁸	\HP	𠁸	\Hu
⦿	\HC	𓁍	\Hibw	𠁹	\Hplural	𠁹	\HV
𓅓	\HD	𓁎	\HJ	𠁺	\Hplus	𠁺	\Hv
𓅓	\Hd	𓁏	\Hj	𠁻	\HQ	𠁻	\Hvbar
»	\Hdual	𓁐	\Hk	𠁻	\Hq	𓁑	\Hw
𓂀	\He	𓁒	\HK	𠁻	\Hquery	𠁻	\HW
𓂀	\HE	𓁓	\HL	𓁔	\HR	𓁔	\HX
𓂀	\Hf	𓁕	\HL	𠁻	\Hr	𠁻	\Hx
𓂀	\HF	𓁖	\Hm	𠁻	\Hs	𓁗	\HY
𓂀	\HG	𓁘	\HM	𠁻	\HS	𠁻	\Hy
𓂀	\Hg	𓁙	\Hman	𠁻	\Hscribe	𠁻	\Hz
𠁻	\Hh	𓁚	\Hms	𠁻	\Hslash	𠁻	\HZ
𓁌	\HH	𓁛	\HN	𠁻	\Hsv		
	\Hone	𓁜	\Hhundred	𠁻	\HXthousand	𓁝	\Hmillion
𠁻	\Hten	𓁞	\Hthousand	𠁻	\HCthousand		

The hierogl 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 “𓁓 𓁑 𓁓 𓁔”). See the hierogl documentation for more information.

TABLE 272: linearA Linear A Script

ㅏ	\LinearAI	ㅑ	\LinearACIX	ㅓ	\LinearACXVII	ㅕ	\LinearACCXCV
ㅓ	\LinearAII	ㅑ	\LinearAC	ㅓ	\LinearACXCVIII	ㅕ	\LinearACCXCVI
ㅑ	\LinearAIII	ㅑ	\LinearACI	ㅓ	\LinearACXCIX	ㅕ	\LinearACCXCVII
ㅓ	\LinearAIV	ㅓ	\LinearACII	ㅓ	\LinearACC	ㅕ	\LinearACCXCVIII
ㅑ	\LinearAV	ㅓ	\LinearACIII	ㅓ	\LinearACCI	ㅕ	\LinearACCXCVIX
ㅓ	\LinearAVI	ㅓ	\LinearACIV	ㅓ	\LinearACCII	ㅕ	\LinearACCC
ㅓ	\LinearAVII	ㅓ	\LinearACV	ㅓ	\LinearACCIII	ㅕ	\LinearACCCI
ㅓ	\LinearAVIII	ㅓ	\LinearACVI	ㅓ	\LinearACCIV	ㅓ	\LinearACCCII
ㅓ	\LinearAIX	ㅓ	\LinearACVII	ㅓ	\LinearACCV	ㅓ	\LinearACCCIII
ㅓ	\LinearAX	ㅓ	\LinearACVIII	ㅓ	\LinearACCVI	ㅓ	\LinearACCCIV
ㅓ	\LinearAXI	ㅓ	\LinearACIX	ㅓ	\LinearACCVII	ㅓ	\LinearACCCV
ㅓ	\LinearAXII	ㅓ	\LinearACX	ㅓ	\LinearACCVIII	ㅓ	\LinearACCCVI
ㅓ	\LinearAXIII	ㅓ	\LinearACXI	ㅓ	\LinearACCIX	ㅓ	\LinearACCCVII

(continued on next page)

(continued from previous page)

‡ \LinearAXIV	§ \LinearACXII	¶ \LinearACCX	¤ \LinearACCCVIII
ʌ \LinearAXV	÷ \LinearACXIII	× \LinearACCXI	⊖ \LinearACCCIX
₪ \LinearAXVI	⊗ \LinearACXIV	† \LinearACCXII	₪ \LinearACCCX
⌚ \LinearAXVII	◎ \LinearACXV	⊛ \LinearACCXIII	⌚ \LinearACCCXI
₵ \LinearAXVIII	₵ \LinearACXVI	₵ \LinearACCXIV	₵ \LinearACCCXII
₩ \LinearAXIX	₩ \LinearACXVII	₩ \LinearACCXV	₩ \LinearACCCXIII
↑ \LinearAXX	↑ \LinearACXVIII	↑ \LinearACCXVI	↑ \LinearACCCXIV
⤠ \LinearAXXI	⤠ \LinearACXIX	⤠ \LinearACCXVII	⤠ \LinearACCCXV
⤡ \LinearAXXII	⤡ \LinearACXX	⤡ \LinearACCXVIII	⤡ \LinearACCCXVI
⤢ \LinearAXXIII	⤢ \LinearACXXI	⤢ \LinearACCXIX	⤢ \LinearACCCXVII
⤣ \LinearAXXIV	⤣ \LinearACXXII	⤣ \LinearACCXX	⤣ \LinearACCCXVIII
⤤ \LinearAXXV	⤤ \LinearACXXIII	⤤ \LinearACCXXI	⤤ \LinearACCCXIX
⤥ \LinearAXXVI	⤥ \LinearACXXIV	⤥ \LinearACCXXII	⤥ \LinearACCCXX
⤦ \LinearAXXVII	⤦ \LinearACXXV	⤦ \LinearACCXXIII	⤦ \LinearACCCXXI
⤧ \LinearAXXVIII	⤧ \LinearACXXVI	⤧ \LinearACCXXIV	⤧ \LinearACCCXXII
⤨ \LinearAXXIX	⤨ \LinearACXXVII	⤨ \LinearACCXXV	⤨ \LinearACCCXXIII
⤩ \LinearAXXX	⤩ \LinearACXXVIII	⤩ \LinearACCXXVI	⤩ \LinearACCCXXIV
⤪ \LinearAXXXI	⤪ \LinearACXXIX	⤪ \LinearACCXXVII	⤪ \LinearACCCXXV
⤫ \LinearAXXXII	⤫ \LinearACXXX	⤫ \LinearACCXXVIII	⤫ \LinearACCCXXVI
⤬ \LinearAXXXIII	⤬ \LinearACXXXI	⤬ \LinearACCXXIX	⤬ \LinearACCCXXVII
⤭ \LinearAXXXIV	⤭ \LinearACXXXII	⤭ \LinearACCXXX	⤭ \LinearACCCXXVIII
⤮ \LinearAXXXV	⤮ \LinearACXXXIII	⤮ \LinearACCXXXI	⤮ \LinearACCCXXIX
⤯ \LinearAXXXVI	⤯ \LinearACXXXIV	⤯ \LinearACCXXXII	⤯ \LinearACCCXXX
⤰ \LinearAXXXVII	⤰ \LinearACXXXV	⤰ \LinearACCXXXIII	⤰ \LinearACCCXXXI
⤱ \LinearAXXXVIII	⤱ \LinearACXXXVI	⤱ \LinearACCXXXIV	⤱ \LinearACCCXXXII
⤲ \LinearAXXXIX	⤲ \LinearACXXXVII	⤲ \LinearACCXXXV	⤲ \LinearACCCXXXIII
⤳ \LinearAXL	⤳ \LinearACXXXVIII	⤳ \LinearACCXXXVI	⤳ \LinearACCCXXXIV
⤴ \LinearAXLI	⤴ \LinearACXXXIX	⤴ \LinearACCXXXVII	⤴ \LinearACCCXXXV
⤵ \LinearAXLII	⤵ \LinearACXL	⤵ \LinearACCXXXVIII	⤵ \LinearACCCXXXVI
⤶ \LinearAXLIII	⤶ \LinearACXLI	⤶ \LinearACCXXXIX	⤶ \LinearACCCXXXVII
⤷ \LinearAXLIV	⤷ \LinearACXLII	⤷ \LinearACCXL	⤷ \LinearACCCXXXVIII
⤸ \LinearAXLV	⤸ \LinearACXLIII	⤸ \LinearACCXLI	⤸ \LinearACCCXXXIX
⤹ \LinearAXLVI	⤹ \LinearACXLIV	⤹ \LinearACCXLI	⤹ \LinearACCCXL
⤺ \LinearAXLVII	⤺ \LinearACXLV	⤺ \LinearACCXLI	⤺ \LinearACCCXL
⤻ \LinearAXLVIII	⤻ \LinearACXLVI	⤻ \LinearACCXLIV	⤻ \LinearACCCXLII
⤼ \LinearAXLIX	⤼ \LinearACXLVII	⤼ \LinearACCXLV	⤼ \LinearACCCXLIII
⤽ \LinearAL	⤽ \LinearACXLVIII	⤽ \LinearACCXLVI	⤽ \LinearACCCXLIV
⤾ \LinearALI	⤾ \LinearACXLIX	⤾ \LinearACCXLVII	⤾ \LinearACCCXLV
⤿ \LinearALII	⤿ \LinearACL	⤿ \LinearACCXLVIII	⤿ \LinearACCCXLVI
⤿ \LinearALIII	⤿ \LinearACLI	⤿ \LinearACCXLIX	⤿ \LinearACCCXLVII
⤿ \LinearALIV	⤿ \LinearACLI	⤿ \LinearACCL	⤿ \LinearACCCXLVIII
⤿ \LinearALV	⤿ \LinearACLIII	⤿ \LinearACCLI	⤿ \LinearACCCXLIX
⤿ \LinearALVI	⤿ \LinearACLIV	⤿ \LinearACCLI	⤿ \LinearACCL
⤿ \LinearALVII	⤿ \LinearACLV	⤿ \LinearACCLIII	⤿ \LinearACCL
⤿ \LinearALVIII	⤿ \LinearACLVI	⤿ \LinearACCLIV	⤿ \LinearACCLII
⤿ \LinearALIX	⤿ \LinearACLVII	⤿ \LinearACCLV	⤿ \LinearACCLIII
⤿ \LinearALX	⤿ \LinearACLVIII	⤿ \LinearACCLVI	⤿ \LinearACCLIV
⤿ \LinearALXI	⤿ \LinearACLIX	⤿ \LinearACCLVII	⤿ \LinearACCLV
⤿ \LinearALXII	⤿ \LinearACLX	⤿ \LinearACCLVIII	⤿ \LinearACCLVI
⤿ \LinearALXIII	⤿ \LinearACLXI	⤿ \LinearACCLIX	⤿ \LinearACCLVII
⤿ \LinearALXIV	⤿ \LinearACLXII	⤿ \LinearACCLX	⤿ \LinearACCLVIII
⤿ \LinearALXV	⤿ \LinearACLXIII	⤿ \LinearACCLXI	⤿ \LinearACCLIX

(continued on next page)

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♪ \LinearALXVI	♪ \LinearALXIV	♪ \LinearACCLXII	♪ \LinearACCCLX
♪ \LinearALXVII	♪ \LinearALXV	♪ \LinearACCLXIII	♪ \LinearACCCLXI
♪ \LinearALXVIII	♪ \LinearALXVI	♪ \LinearACCLXIV	♪ \LinearACCCLXII
♪ \LinearALXIX	♪ \LinearALXVII	♪ \LinearACCLXV	♪ \LinearACCCLXIII
♪ \LinearALXX	♪ \LinearALXVIII	♪ \LinearACCLXVI	♪ \LinearACCCLXIV
♪ \LinearALXXI	♪ \LinearALXIX	♪ \LinearACCLXVII	♪ \LinearACCCLXV
♪ \LinearALXXII	♪ \LinearALXX	♪ \LinearACCLXVIII	♪ \LinearACCCLXVI
♪ \LinearALXXIII	♪ \LinearALXXI	♪ \LinearACCLXIX	♪ \LinearACCCLXVII
♪ \LinearALXXIV	♪ \LinearALXXII	♪ \LinearACCLXX	♪ \LinearACCCLXVIII
♪ \LinearALXXV	♪ \LinearALXXIII	♪ \LinearACCLXXI	♪ \LinearACCCLXIX
♪ \LinearALXXVI	♪ \LinearALXXIV	♪ \LinearACCLXXII	♪ \LinearACCCLXX
♪ \LinearALXXVII	♪ \LinearALXXV	♪ \LinearACCLXXIII	♪ \LinearACCCLXXI
♪ \LinearALXXVIII	♪ \LinearALXXVI	♪ \LinearACCLXXIV	♪ \LinearACCCLXXII
♪ \LinearALXXIX	♪ \LinearALXXVII	♪ \LinearACCLXXV	♪ \LinearACCCLXXIII
♪ \LinearALXXX	♪ \LinearALXXVIII	♪ \LinearACCLXXVI	♪ \LinearACCCLXXIV
♪ \LinearALXXXI	♪ \LinearALXXIX	♪ \LinearACCLXXVII	♪ \LinearACCCLXXV
♪ \LinearALXXXII	♪ \LinearALXXX	♪ \LinearACCLXXVIII	♪ \LinearACCCLXXVI
♪ \LinearALXXXIII	♪ \LinearALXXXI	♪ \LinearACCLXXIX	♪ \LinearACCCLXXVII
♪ \LinearALXXXIV	♪ \LinearALXXXII	♪ \LinearACCLXXX	♪ \LinearACCCLXXVIII
♪ \LinearALXXXV	♪ \LinearALXXXIII	♪ \LinearACCLXXXI	♪ \LinearACCCLXXIX
♪ \LinearALXXXVI	♪ \LinearALXXXIV	♪ \LinearACCLXXXII	♪ \LinearACCCLXXX
♪ \LinearALXXXVII	♪ \LinearALXXXV	♪ \LinearACCLXXXIII	♪ \LinearACCCLXXXI
♪ \LinearALXXXVIII	♪ \LinearALXXXVI	♪ \LinearACCLXXXIV	♪ \LinearACCCLXXXII
♪ \LinearALXXXIX	♪ \LinearALXXXVII	♪ \LinearACCLXXXV	♪ \LinearACCCLXXXIII
♪ \LinearALXXXX	♪ \LinearALXXXVIII	♪ \LinearACCLXXXVI	♪ \LinearACCCLXXXIV
♪ \LinearAXCI	♪ \LinearALXXXIX	♪ \LinearACCLXXXVII	♪ \LinearACCCLXXXV
♪ \LinearAXCII	♪ \LinearALXXXX	♪ \LinearACCLXXXVIII	♪ \LinearACCCLXXXVI
♪ \LinearAXCIII	♪ \LinearACXCI	♪ \LinearACCLXXXIX	♪ \LinearACCCLXXXVII
♪ \LinearAXCIV	♪ \LinearACXCII	♪ \LinearACCLXXXX	♪ \LinearACCCLXXXVIII
♪ \LinearAXCV	♪ \LinearACXCIII	♪ \LinearACXCII	♪ \LinearACCCLXXXIX
♪ \LinearAXCVI	♪ \LinearACXCIV	♪ \LinearACXCIII	♪ \LinearACCXCIV
♪ \LinearAXCVII	♪ \LinearACXCV	♪ \LinearACXCIV	♪ \LinearACCXCIV
♪ \LinearAXCVIII	♪ \LinearACXCVI	♪ \LinearACXCIV	♪ \LinearACCXCIV

TABLE 273: *linearb* Linear B Basic and Optional Letters

\Ba	\Bja	\Bmu	\Bpte	\Broii	\Bto
\Baii	\Bje	\Bna	\Bpu	\Bru	\Btu
\Baiii	\Bjo	\Bne	\Bpuii	\Bsa	\Btwo
\Bau	\Bju	\Bni	\Bqa	\Bse	\Bu
\Bda	\Bka	\Bno	\Bqe	\Bsi	\Bwa
\Bde	\Bke	\Bnu	\Bqi	\Bso	\Bwe
\Bdi	\Bki	\Bnwa	\Bqo	\Bsu	\Bwi
\Bdo	\Bko	\Bo	\Bra	\Bswa	\Bwo
\Bdu	\Bku	\Bpa	\Braii	\Bswi	\Bza
\Bdwe	\Bma	\Bpaiii	\Braiii	\Bta	\Bze
\Bdwo	\Bme	\Bpe	\Bre	\Btaii	\Bzo
\Be	\Bmi	\Bpi	\Bri	\Bte	
\Bi	\Bmo	\Bpo	\Bro	\Bti	

These symbols must appear either within the argument to `\textlinb` or following the `\linbfamily` font-selection command within a scope. Single-character shortcuts are also supported: Both “`\textlinb{\Bpa\Bki\Bna}`” and “`\textlinb{pcn}`” produce “ $\text{\Bpa}\text{\Bki}\text{\Bna}$ ”, for example. See the *linearb* documentation for more information.

TABLE 274: *linearb* Linear B Numerals

I	\BNi		\BNvii	==	\BNxl	○	\BNC	oooo	\BNDcc
II	\BNii		\BNviii	==	\BNl	○	\BNcc	oooo	\BNDccc
III	\BNiii		\BNix	==	\BNlx	○○	\BNccc	ooooo	\BNcm
II	\BNiv	-	\BNx	==	\BNlxx	○○	\BNcd	○○-	\BNm
II	\BNv	=	\BNxx	==	\BNlxxx	○○○	\BNd		
III	\BNvi	≡	\BNxxx	==	\BNxc	○○○	\BNdc		

These symbols must appear either within the argument to `\textlinb` or following the `\linbfamily` font-selection command within a scope.

TABLE 275: *linearb* Linear B Weights and Measures

\Btalent	\BPtalent	\P	\BPvolb	\J	\BPvolcf	\G	\BPwtb	\Z	\BPwtd
\Bvola	\BPvola	\T	\BPvolcd	\F	\BPwta	\H	\BPwtc		

These symbols must appear either within the argument to `\textlinb` or following the `\linbfamily` font-selection command within a scope.

TABLE 276: linearb Linear B Ideograms

Ϙ	\BPamphora	ϙ	\BPchassis	Ϙ	\BPman	Ϙ	\BPwheat
Ϙ	\BParrow	ϙ	\BPCloth	Ϙ	\BPNanny	Ϙ	\BPwheel
Ϙ	\BPbarley	ϙ	\BPCow	Ϙ	\BPPolive	Ϙ	\BPwine
Ϙ	\BPbilly	ϙ	\BPCup	Ϙ	\BPOx	Ϙ	\BPwineiih
Ϙ	\BPboar	ϙ	\BPEwe	Ϙ	\BPPig	Ϙ	\BPwineiiih
Ϙ	\BPbronze	ϙ	\BPFoal	Ϙ	\BPRam	Ϙ	\BPwineivh
Ϙ	\BPbull	ϙ	\BPGoat	Ϙ	\BPSheep	Ϙ	\BPwoman
Ϙ	\BPCauldroni	ϙ	\BPGoblet	Ϙ	\BPsow	Ϙ	\BPwool
Ϙ	\BPCauldronii	ϙ	\BPGold	Ϙ	\BPspear		
Ϙ	\BPCchariot	ϙ	\BPhorse	Ϙ	\BPsword		

These symbols must appear either within the argument to `\textlinb` or following the `\linbfamily` font-selection command within a scope.

TABLE 277: linearb Unidentified Linear B Symbols

ϗ	\BUi	Ϙ	\BUiv	Ϻ	\BUvii	Ϙ	\BUx	ϐ	\Btwe
Ϙ	\BUii	ϙ	\BUv	ϻ	\BUviii	ϙ	\BUxi		
Ϙ	\BUiii	ϙ	\BUvi	ϙ	\BUix	ϐ	\BUxii		

These symbols must appear either within the argument to `\textlinb` or following the `\linbfamily` font-selection command within a scope.

TABLE 278: cypriot Cypriot Letters

>*	\Ca	ϗ	\Cku	Ϙ	\Cmu	Ϛ	\Cpo	Ϻ	\Cso	Ͽ	\Cwi
*	\Ce	Ѷ	\Cla	Ҭ	\Cna	߻	\Cpu	߻	\Csu	߻	\Cwo
Ѽ	\Cga	߻	\Cle	߻	\Cne	߻	\Cra	߻	\Cta	߻	\Cxa
ࡗ	\Ci	߻	\Cli	ࡗ	\Cni	߻	\Cre	߻	\Cte	߻	\Cxe
ࡇ	\Cja	ࡇ	\Clo	ࡇ	\Cno	ࡇ	\Cri	ࡇ	\Cti	ࡇ	\Cya
ࡇ	\Cjo	ࡇ	\Clu	ࡇ	\Cnu	ࡇ	\Cro	ࡇ	\Cto	ࡇ	\Cyo
ࡇ	\Cka	ࡇ	\Cma	ࡇ	\Co	ࡇ	\Cru	ࡇ	\Ctu	ࡇ	\Cza
ࡇ	\Cke	ࡇ	\Cme	ࡇ	\Cpa	ࡇ	\Csa	ࡇ	\Cu	ࡇ	\Czo
ࡇ	\Cki	ࡇ	\Cmi	ࡇ	\Cpe	ࡇ	\Cse	ࡇ	\Cwa		
ࡇ	\Cko	ࡇ	\Cmo	ࡇ	\Cpi	ࡇ	\Csi	ࡇ	\Cwe		

These symbols must appear either within the argument to `\textcypr` or following the `\cyprfamily` font-selection command within a scope. Single-character shortcuts are also supported: Both “`\textcypr{\Cpa\Cki\Cna}`” and “`\textcypr{pcn}`” produce “ࡇࡇࡇ”, for example. See the cypriot documentation for more information.

TABLE 279: *sarabian* South Arabian Letters

◦	\SAa	◊	\SAz	◊	\SAM	◊	\SAsd	◊	\SAdb
□	\SAb	◊	\SAhd	◊	\SAN	◊	\SAq	◊	\SATb
⊤	\SAg	◊	\SATd	◊	\SAs	◊	\SAr	◊	\SAGa
⊣	\SAd	◊	\SAY	◊	\SAf	◊	\SAsv	◊	\SAdz
⊣	\SAh	◊	\SAk	◊	\SAlq	◊	\SAT	◊	\SAsa
◊	\SAw	◊	\SAI	◊	\SAo	◊	\SAhu	◊	\SAdd

These symbols must appear either within the argument to `\textssarab` or following the `\sarabfamily` font-selection command within a scope. Single-character shortcuts are also supported: Both “`\textssarab{\SAb\SAk\SAN}`” and “`\textssarab{bkn}`” produce “ $\sqcap\sqcup\sqcap$ ”, for example. See the *sarabian* documentation for more information.

TABLE 280: *teubner* Archaic Greek Letters and Greek Numerals

Ϙ	\Coppa [†]	F	\Digamma*	ϙ	\sampi*	Ϛ	\varstigma
ϙ	\coppa [†]	ϙ	\kappa	Ϛ	\Stigma		
ϝ	\digamma*,‡	Ϛ	\Sampi	Ϛ	\stigma*		

* Technically, these symbols do not require *teubner*; it is sufficient to load the *babel* package with the *greek* option (upon which *teubner* depends)—but use `\qoppa` for `\kappa` and `\ddigamma` for `\digamma`.

† For compatibility with other naming conventions *teubner* defines `\Koppa` as a synonym for `\Coppa` and `\varcoppa` as a synonym for `\coppa`.

‡ If both *teubner* and *amssymb* are loaded, *teubner*’s `\digamma` replaces *amssymb*’s `\digamma`, regardless of package-loading order.

7 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 281: `textcomp` Genealogical Symbols

<code>*</code>	<code>\textborn</code>	<code>◊</code>	<code>\textdivorced</code>	<code>∞</code>	<code>\textmarried</code>
<code>+</code>	<code>\textdied</code>		<code>\textleaf</code>		

TABLE 282: `wasysym` General Symbols

	<code>\ataribox</code>		<code>\clock</code>		<code>\LEFTarrow</code>		<code>\smiley</code>
	<code>\bell</code>		<code>\diameter</code>		<code>\lightning</code>		<code>\sun</code>
	<code>\blacksmiley</code>		<code>\DOWNarrow</code>		<code>\phone</code>		<code>\UParrow</code>
	<code>\Bowtie</code>		<code>\frownie</code>		<code>\pointer</code>		<code>\wasylozenge</code>
	<code>\brokenvert</code>		<code>\invdiameter</code>		<code>\recorder</code>		
	<code>\checked</code>		<code>\kreuz</code>		<code>\RIGHTarrow</code>		

TABLE 283: `wasysym` Circles

	<code>\CIRCLE</code>		<code>\LEFTcircle</code>		<code>\RIGHTcircle</code>		<code>\rightturn</code>
	<code>\Circle</code>		<code>\Leftcircle</code>		<code>\Rightcircle</code>		
	<code>\LEFTCIRCLE</code>		<code>\RIGHTCIRCLE</code>		<code>\leftturn</code>		

TABLE 284: `wasysym` Musical Symbols

	<code>\eighthnote</code>		<code>\halfnote</code>		<code>\twonotes</code>		<code>\fullnote</code>		<code>\quarternote</code>
-------------------------------------------------------------------------------------	--------------------------	-------------------------------------------------------------------------------------	------------------------	-------------------------------------------------------------------------------------	------------------------	-------------------------------------------------------------------------------------	------------------------	---------------------------------------------------------------------------------------	---------------------------

See also `\flat`, `\sharp`, and `\natural` (Table 201 on page 65).

TABLE 285: `arev` Musical Symbols

	<code>\quarternote</code>		<code>\eighthnote</code>		<code>\sixteenthnote</code>
-------------------------------------------------------------------------------------	---------------------------	-------------------------------------------------------------------------------------	--------------------------	-------------------------------------------------------------------------------------	-----------------------------

See also `\flat`, `\sharp`, and `\natural` (Table 201 on page 65).

TABLE 286: 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 287: harmony Musical Accents

	\Ferli{A}\Ferli{a}*		\Ohne{A}\Ohne{a}*
	\Fermi{A}\Fermi{a}		\Umd{A}\Umd{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 “”. All arguments except the first can be omitted: “`\HH.X.....`” produces “”. `\Takt` takes two arguments and composes them into a musical time signature. For example, “`\Takt{12}{8}`” produces “”. As two special cases, “`\Takt{c}{0}`” produces “” and “`\Takt{c}{1}`” produces “”.

The `musixtex` package must be installed to use harmony.

TABLE 288: `manfnt` Dangerous Bend Symbols

	\dbend		\lhdbend		\reversedvideobend
--	--------	--	----------	--	--------------------

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

TABLE 289: Miscellaneous `manfnt` Symbols

	\manboldkidney		\manpenkidney
	\manconcentriccircles		\manquadrifolium
	\manconcentricdiamond		\manquartercircle
	\mancone		\manrotatedquadrifolium
	\mancube		\manrotatedquartercircle
	\manerrarrow		\manstar
	\manfilledquartercircle		\mantiltPennib
	\manhpennib		\mantriangledown
	\animpossiblecube		\mantriangleright
	\mankidney		\mantriangleup
	\manlhpennib		\manvpennib

TABLE 290: marvosym Navigation Symbols

▶	\Forward	▼	\MoveDown	◀◀	\RewindToIndex	▲	\ToTop
▶▶	\ForwardToEnd	▲	\MoveUp	◀	\RewindToStart		
▶▶▶	\ForwardToIndex	◀	\Rewind	▼	\ToBottom		

TABLE 291: 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 292: marvosym Information Symbols

🚲	\Bicycle	⚽	\Football	👉	\Pointinghand
☒	\Checkedbox	🚹	\Gentsroom	♿	\Wheelchair
⌚	\Clocklogo	🏢	\Industry	✍	\Writinghand
☕	\Coffeecup	ⓘ	\Info		
☒	\Crossedbox	🚻	\Ladiesroom		

TABLE 293: Other marvosym Symbols

☥	\Ankh	✝	\Cross	♡	\Heart	☺	\Smiley
🦇	\Bat	🇫	\FHB0logo	🇬	\MartinVogel	👩	\Womanface
💐	\Bouquet	🇫	\FHB0LOGO	🇬	\Mundus	☯	\Yinyang
❖	\Celtcross	☺	\Frowny	@	\MVAt		
Ⓐ	\CircledA	🇫	\FullFHB0	→	\MVRrightarrow		

TABLE 294: Miscellaneous universa Symbols

⟳ \bauforms ⟲ \bauhead

TABLE 295: Miscellaneous universal Symbols

▬	\baudash	Ⓜ	\bauforms	●	\bauquarter	○	\varQ
▬▬	\bauequal	Ⓜ	\bauhead	■	\bauquestion		
▬▬▬	\bauface	✚	\bauplus	✚✚	\bauwindow		

TABLE 296: Miscellaneous fourier Symbols

	\bomb		\grimace		\textthing*		\textxswup*
	\danger		\noway		\textxswdown*		

* `fourier` defines math-mode aliases for a few of the preceding symbols: `\thething` (“”), `\xswordsup` (“”), and `\xswordsdown` (“”).

TABLE 297: 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 298: ifsym Alpine Symbols

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

TABLE 299: 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 300: Other ifsym Symbols

	\FilledSectioningDiamond		\Letter		\Radiation
	\Fire		\PaperLandscape		\SectioningDiamond
	\Irritant		\PaperPortrait		\Telephone
	\Cube{1}		\Cube{3}		\Cube{5}
	\Cube{2}		\Cube{4}		\Cube{6}
	\StrokeOne		\StrokeThree		\StrokeFive
	\StrokeTwo		\StrokeFour		

TABLE 301: clock Clocks

\ClockStyle	\ClockFramefalse	\ClockFrametrue
0		
1		
2		
3		

The `clock` package provides a `\clock` command to typeset an arbitrary time on an analog clock (and `\clocktime` to typeset the document's build time). For example, the clocks in the above table were produced with `\clock{15}{41}`. Clock symbols are composed from a font of clock-face fragments using one of four values for `\ClockStyle` and either `\ClockFrametrue` or `\ClockFrametrue` as illustrated above. See the `clock` documentation for more information.

TABLE 302: epsdice Dice

	\epsdice{1}		\epsdice{3}		\epsdice{5}
	\epsdice{2}		\epsdice{4}		\epsdice{6}

TABLE 303: fcdice Dice

	\fcdice{1}		\fcdice{3}		\fcdice{5}
	\fcdice{2}		\fcdice{4}		\fcdice{6}

The `\fcdice` command accepts values larger than 6. For example, “`\fcdice{47}`” produces “”.

TABLE 304: hhcount Tally Markers

	\fcscore{1}		\fcscore{3}		\fcscore{5}
	\fcscore{2}		\fcscore{4}		\fcscore{6}

The `\fcscore` command accepts values larger than 5. For example, “`\fcscore{47}`” produces “”.

TABLE 305: skull Symbols

 \skull

TABLE 306: Non-Mathematical mathabx Symbols

 \rip

TABLE 307: skak Chess Informator Symbols

\mp	\bbetter	\circ	\doublepawns	$\circ\circ$	\seppawns
$-+$	\bdecisive	\perp	\ending	O-O	\shortcastling
\square	\betteris	$=$	\equal	\oplus	\timelimit
\boxplus	\bishoppair	\Leftrightarrow	\file	∞	\unclear
\mp	\bupperhand	\gg	\kside	$\circ\circ$	\unitedpawns
\times	\capturesymbol	O-O-O	\longcastling	R	\various
O	\castlingchar	X	\markera	\pm	\wbetter
-	\castlinghyphen	O	\markerb	$+-$	\wdecisive
\boxplus	\centre	#	\mate	\times	\weakpt
+	\checksymbol	>	\morepawns	\sqsubset	\with
RR	\chesscomment	O	\moreroom	\rightarrow	\withattack
	\chessetc	N	\novelty	\triangle	\withidea
—	\chesssee	\square	\onlymove	\uparrow	\withinit
\approx	\compensation	\blacksquare	\opposbishops	\sqcup	\without
\Leftarrow	\counterplay	\circlearrowleft	\passedpawn	\pm	\wupperhand
C	\devadvantage	\ll	\qside	\odot	\zugzwang
$\not\equiv$	\diagonal	\blacksquare	\samebishops		

TABLE 308: *skak* Chess Pieces and Chessboard Squares

	\BlackBishopOnBlack		\BlackRookOnBlack		\WhiteKingOnBlack
	\BlackBishopOnWhite		\BlackRookOnWhite		\WhiteKingOnWhite
	\BlackEmptySquare		\symbishop		\WhiteKnightOnBlack
	\BlackKingOnBlack		\symking		\WhiteKnightOnWhite
	\BlackKingOnWhite		\symknight		\WhitePawnOnBlack
	\BlackKnightOnBlack		\sympawn		\WhitePawnOnWhite
	\BlackKnightOnWhite		\symqueen		\WhiteQueenOnBlack
	\BlackPawnOnBlack		\symrook		\WhiteQueenOnWhite
	\BlackPawnOnWhite		\WhiteBishopOnBlack		\WhiteRookOnBlack
	\BlackQueenOnBlack		\WhiteBishopOnWhite		\WhiteRookOnWhite
	\BlackQueenOnWhite		\WhiteEmptySquare		

The *skak* package also provides commands for drawing complete chessboards. See the *skak* documentation for more information.

TABLE 309: *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 ①, ②, ③, ..., 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 310: metre Metrical Symbols

x	\a	\wedge	\bBm		\cc	\wedge	\Mbb	:	\Pppp	\otimes	\t
\s	\B	\wedge	\bbm		\Ccc	\wedge	\mbbx	:	\pppp	_	\tsbm
\u	\b	\wedge	\Bbm	-	\m	\oo	\oo	:	\Pffff	_	\tsmb
\w	\Bb	\wedge	\bbmb	_	\M	.	\p	:	\ppppp	_	\tsmm
\w	\BB	\wedge	\bbmx	\x	\ma	_	\pm	_	\ps	_	\vppm
\w	\bb	\wedge	\bm	\d	\Mb	:	\pp	:	\pxp	_	\vpppm
\w	\bB	\wedge	\Bm	\o	\mb	:	\Pp	:	\Pxp	\::	\x
\w	\bba		\c	\wedge	\mBb	_	\ppm	\~	\R		
\w	\bbb		\C	\wedge	\mbB	_:	\ppp	\~	\r		
\w	\BBm	\	\Cc	\wedge	\mbb	_:	\Ppp	\otimes	\T		

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

TABLE 311: metre Small and Large Metrical Symbols

\div	\anaclasis	\div	\Anaclasis
<	\antidiple	<	\Antidiple
\wedge	\antidiple*	\wedge	\Antidiple*
\circ	\antisigma	\circ	\Antisigma
\ast	\asteriscus	\ast	\Asteriscus
\wedge	\catalexis	\wedge	\Catalexis
>	\diple	>	\Diple
\wedge	\diple*	\wedge	\Diple*
_	\obelus	_	\Obelus
\div	\obelus*	\div	\Obelus*
\sim	\respondens	\sim	\Respondens
\otimes	\terminus	\otimes	\Terminus
\oplus	\terminus*	\oplus	\Terminus*

TABLE 312: teubner Metrical Symbols

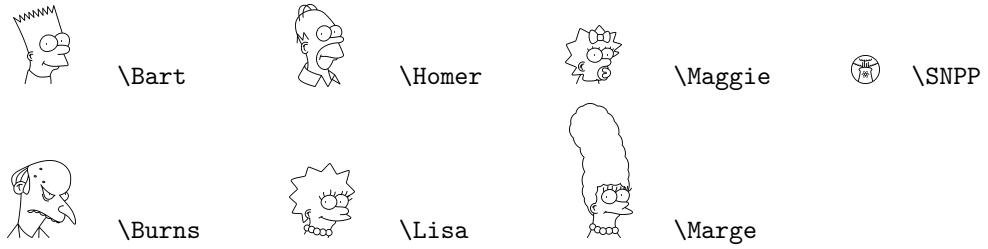
\oo	\aeolicbii	\o	\barbrevis	+	\ipercatal
\ooo	\aeolicbiii	\omega	\bbbrevis	_	\longa
\oooo	\aeolicbiv	\u	\brevis	\wedge	\ubarbbrevis
x	\anceps	\wedge	\catal	\wedge	\ubarbrevis
\ast	\ancepsdbrevis	\cap	\corona	\wedge	\barsbrevis
\barwedge	\banceps	\cup	\coronainv	\o	\ubrevislonga
\wedge	\barbbrevis	H	\hiatus		

The `teubner` package provides a `\newmetrics` command that helps users combine the preceding symbols as well as other `teubner` symbols. For example, the predefined `\pentam` symbol uses `\newmetrics` to juxtapose six `\longas`, two `\barbbrevises`, four `\brevises`, and a `\dBar` into “`_\wedge_\wedge_\wedge||_\wedge_\wedge_\wedge`”. See the `teubner` documentation for more information.

TABLE 313: `dictsym` Dictionary Symbols

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

TABLE 314: `simpsons` Characters from *The Simpsons*



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:

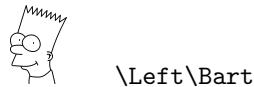


TABLE 315: pmboxdraw Box-Drawing Symbols

	\textblock		\textSFli		\textSFxli		\textSFxxiii
	\textdkshade		\textSFlii		\textSFxlii		\textSFxxiv
	\textdnblock		\textSFliii		\textSFxliii		\textSFxxv
	\textlfblock		\textSFliv		\textSFxliv		\textSFxxvi
	\textltshade		\textSFv		\textSFxlix		\textSFxxvii
	\textrtblock		\textSFvi		\textSFxlvi		\textSFxxviii
	\textSFi		\textSFvii		\textSFxlvi		\textSFxxxix
	\textSFii		\textSFviii		\textSFxlvii		\textSFxxxvi
	\textSFiii		\textSFx		\textSFxlviii		\textSFxxxvii
	\textSFiv		\textSFxi		\textSFxx		\textSFxxxviii
	\textSFix		\textSFxix		\textSFxxi		\textshade
	\textSF1		\textSFxl		\textSFxxii		\textupblock

Code Page 437 (CP437), which was first utilized by the original IBM PC, contains the set of box-drawing symbols (sides, corners, and intersections of single- and double-ruled boxes) shown above in character positions 176–223. These symbols also appear in the Unicode Box Drawing and Block Element tables.

The `pmboxdraw` package draws the CP437 box-drawing symbols using `TEX` rules (specifically, `\vrule`) instead of with a font and thereby provides the ability to alter both rule width and the separation between rules. See the `pmboxdraw` documentation for more information.

TABLE 316: staves Magical Staves

	\staveI		\staveXXIV		\staveXLVII
	\staveII		\staveXXV		\staveXLVIII
	\staveIII		\staveXXVI		\staveXLIX
	\staveIV		\staveXXVII		\staveL
	\staveV		\staveXXVIII		\staveLI
	\staveVI		\staveXXIX		\staveLII
	\staveVII		\staveXXX		\staveLIII
	\staveVIII		\staveXXXI		\staveLIV
	\staveIX		\staveXXXII		\staveLV
	\staveX		\staveXXXIII		\staveLVI
	\staveXI		\staveXXXIV		\staveLVII

(continued on next page)

(continued from previous page)

	\staveXII		\staveXXXV		\staveLVIII
	\staveXIII		\staveXXXVI		\staveLIX
	\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.galdrasynning.is/index.php?option=com_content&task=category§ionid=5&id=18&Itemid=60 (TinyURL: <http://tinyurl.com/25979m>). For example, \staveL (“ᛒ”“ᛖ”“ᛑ”) is intended to ward off ghosts and evil spirits.

TABLE 317: pigpen Cipher Symbols

↶ {\\pigpenfont A}	↷ {\\pigpenfont J}	˅ {\\pigpenfont S}
□ {\\pigpenfont B}	□ {\\pigpenfont K}	> {\\pigpenfont T}
└ {\\pigpenfont C}	└ {\\pigpenfont L}	< {\\pigpenfont U}
□ {\\pigpenfont D}	□ {\\pigpenfont M}	˄ {\\pigpenfont V}
□ {\\pigpenfont E}	□ {\\pigpenfont N}	˅ {\\pigpenfont W}
□ {\\pigpenfont F}	□ {\\pigpenfont O}	> {\\pigpenfont X}
└ {\\pigpenfont G}	└ {\\pigpenfont P}	< {\\pigpenfont Y}
□ {\\pigpenfont H}	□ {\\pigpenfont Q}	˄ {\\pigpenfont Z}
└ {\\pigpenfont I}	└ {\\pigpenfont R}	

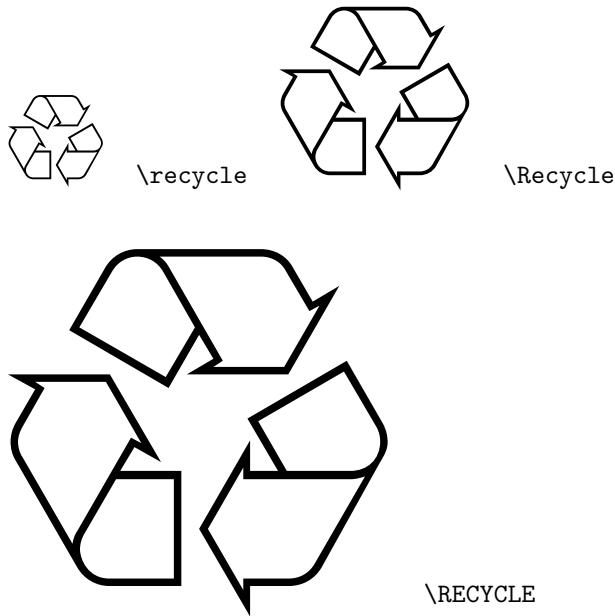
TABLE 318: GИA2e Phases of the Moon

⌚ \MoonPha{1} ⚡ \MoonPha{2} ☽ \MoonPha{3} ☾ \MoonPha{4}

TABLE 319: Other GИA2e Symbols

⌚ \Greenpoint	✉ \Postbox	☎ \Telephone
✉ \Info	❓ \Request	

TABLE 320: recycle Recycling Symbols



The METAFONT code that implements the recycling symbols shown above is, in the words of its author, “awful code [that] doesn’t even put the logo in a box (properly)”. Expect to receive “**Inconsistent equation (off by <number>)**” errors from METAFONT. Fortunately, if you tell METAFONT to proceed past those errors (e.g., by pressing Enter after each one or by specifying “`-interaction=nonstopmode`” on the METAFONT command line) it should produce a valid font.

The commands listed above should be used within a group (e.g., “`{\recycle}`”) because they exhibit the side effect of *changing* the font to the recycle font.

8 Additional Information

Unlike the previous sections of this document, Section 8 does not contain new symbol tables. Rather, it provides additional help in using the Comprehensive L^AT_EX 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 L^AT_EX. And finally, it lists some statistics about this document itself.

8.1 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, L^AT_EX will either output an error message or replace an earlier-defined symbol with a later-defined symbol. Table 321 on the following page 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 321, not impossible. The general procedure is to load the first package, rename the conflicting symbols, and then load the second package. Examine the L^AT_EX 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 *AMS* symbol sets, and L^AT_EX 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 321 because they are designed to be compatible with the symbols they replace. Table 322 on page 102 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}
```

8.2 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 323 on page 102 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 L^AT_EX 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 T_EX 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 102. 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.

8.3 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:

TABLE 321: Symbol Name Clashes

Symbol	$\text{\LaTeX}\ 2\epsilon$	$\mathcal{M}\mathcal{S}$	stmaryrd	wasysym	mathabx	marvosym	bbding	ifsym	dingbat	wsipa
<code>\baro</code>										\ominus
<code>\bigtriangledown</code>			\bigtriangledown							
<code>\bigtriangleup</code>			\bigtriangleup							
<code>\checkmark</code>					\checkmark					
<code>\circleddash</code>						\circ				
<code>\cross</code>							\dagger		\times	
<code>\ggg</code>								\gg		
<code>\Letter</code>									\boxtimes	
<code>\lightning</code>						\not				
<code>\Lightning</code>							\not			
<code>\lll</code>						\ll				
<code>\square</code>							\square		\square	
<code>\Sun</code>							\odot		\odot	
<code>\TriangleDown</code>							\blacktriangledown		\triangleright	
<code>\TriangleUp</code>							\blacktriangleup		\triangleleft	

TABLE 322: Example of a Benign Name Clash

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

TABLE 323: Sample resized delimiters

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

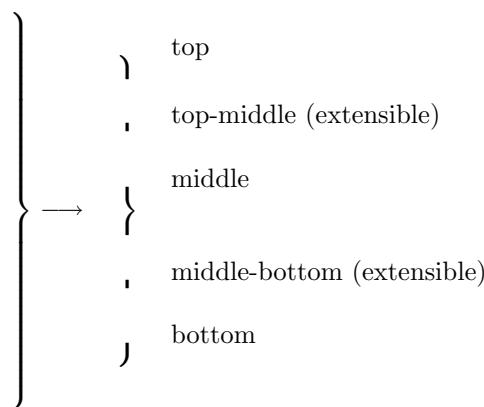


Figure 1: Implementation of variable-sized delimiters

- 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 L^AT_EX 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 L^AT_EX binding for it. For example, the PostScript Symbol font contains a “ \lrcorner ” 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 L^AT_EX 2 _{ε} 's low-level font commands [LAT00] and use T_EX's primitive `\char` command [Knu86a] to request a specific character number in the font.⁵ In fact, `\char` is not strictly necessary; the character can often be entered symbolically. For example, the symbol for an impulse train or Tate-Shafarevich group (“ III ”) 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}{\$\iotaota\$}` produces the definite-description operator (“ ? ”). The disadvantage of the `graphicx`/`graphics` approach is that not every T_EX backend handles graphical transformations.⁶ 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 “ ? ”. Similarly, `tipa`'s `\textrevespsilon` (“ z ”) or `wsipa`'s `\revepsilon` (“ z ”) may be used to express the mathematical notion of “such that” in a cleaner manner than with `\reflectbox` or `\rotatebox`.⁷

Joining and overlapping existing symbols

Symbols that do not exist in any font can sometimes be fabricated out of existing symbols. The L^AT_EX 2 _{ε} source file `fontdef.dtx` contains a number of such definitions. For example, `\models` (see Table 67 on page 30) is defined in that file with:

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

where `\mathrel` and `\joinrel` are used to control the horizontal spacing. `\def` is the T_EX primitive upon which L^AT_EX's `\newcommand` is based. See The T_EXbook [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|}
```

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, L^AT_EX 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-9mu}h}
```

⁵pifont defines a convenient `\Pisymbol` command for accessing symbols in PostScript fonts by number. For example, “`\Pisymbol{psy}{191}`” produces “ \lrcorner ”.

⁶As an example, Xdvi ignores both `\reflectbox` and `\rotatebox`.

⁷More common symbols for representing “such that” include “ $|$ ”, “ $:$ ”, and “ s.t. ”.

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 -9μ 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}`⁸ 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` (“ $\ast\ast$ ”) from a June 2007 post to `comp.text.tex` by Peter Flynn:

```
\newcommand{\asterism}{\smash{%
  \raisebox{-.5ex}{%
    \setlength{\tabcolsep}{-.5pt}%
    \begin{tabular}{@{}cc@{}}
      \multicolumn{2}{c}{\rule[-2ex]{0pt}{0pt}\ast\ast}
    \end{tabular}}}}
```

Note how the space between columns (`\tabcolsep`) and rows (`\rule[-2ex]{0pt}{0pt}`) 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{\mathrel{\mathop{\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 `\backslash`-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` (“ \sim ”) symbols with $0.35x$ -heights of space between them, is rendered as “ $\approx\approx\approx$ ”. `\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: $a \div b \approx c \times d$.

A related `LATEX` command, borrowed from Plain `TEX`, is `\oalign`. `\oalign` 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, `\oalign` uses `TEX`’s tabular syntax instead of `LATEX`’s (i.e., with `\cr` as the row terminator instead of `\backslash`). The following example of `\oalign`, a macro that defines a standard-state symbol (`\stst`, “ \ominus ”) as a superscripted Plimsoll line (`\barcirc`, “ \ominus ”),⁹ is due to an October 2007 `comp.text.tex` post by Donald Arseneau:

```
\makeatletter
\providecommand\barcirc{\mathpalette\@barred\circ}
\def\@barred#1#2{\oalign{\hfil#1-$\hfil\cr\hfil#2$\hfil\cr}}
\newcommand\stst{\mathop{\barcirc}\limits^{\scriptscriptstyle\ominus}}
\makeatother
```

⁸`LATEX`’s `\stackrel` command is similar but is limited to placing a symbol above a binary relation.

⁹While `\barcirc` illustrates how to combine symbols using `\oalign`, the `stmaryrd` package’s `\minuso` command (Table 46 on page 22) provides a similar glyph (“ \ominus ”) as a single, indivisible symbol.

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` (“Ǝ”) and two minus signs (“–”) to produce “Ǝ”, an obscure variation on the infrequently used “3” symbol for “such that” discussed on page 103:

```
\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 “D”. However, the `\declaresslashed` command provides the flexibility to specify the mathematical context of the composite character (operator, relation, punctuation, etc., as will be discussed in Section 8.4), 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 (“I”). This can be declared as follows:

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

`\declaresslashed{·}{·}{·}{·}{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 the next page) to make `\declaresslashed` 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 `\declaresslashed` 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. `\centernot` might be used, for example, to create a “does not imply” symbol:

```
⇒ \not\Longrightarrow  
vs.  
⇒ \centernot\Longrightarrow
```

See the `centernot` documentation for more information.

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 “T” symbol out of `\top` and `\bot` (“T” and “⊥”):

```
\def\topbotatom#1{\hbox{\hbox to 0pt{$\bot$\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 (“ \int ”), while `\ddashint` produces a double-dashed one (“ $\int\int$ ”). The `\Xint` macro defined above can also be used to generate a wealth of new integrals: “ $\int\int\int$ ” (`\Xint\circlearrowright`), “ $\int\int\int$ ” (`\Xint\circlearrowleft`), “ $\int\int\int$ ” (`\Xint\subset`), “ $\int\int\int$ ” (`\Xint\infty`), and so forth.

L^AT_EX 2 _{ϵ} 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 (“ $\perp\!\!\!\perp$ ”) 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 later on this 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\DHl\hksqrt#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 `\neswarro` (“ $\nearrow\swarrow$ ”) and `\nwsearrow` (“ $\nwarrow\searrow$ ”):¹⁰

```

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

```

`\text` resembles L^AT_EX'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:

¹⁰Note that if your goal is to typeset commutative diagrams or pushout/pullback diagrams, then you should probably be using `Xy-pic`.

```
\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 L^AT_EX into accepting “`\O`” as part of a macro name. `\moverlay` takes a list of symbols separated by `\cr` (T_EX’s equivalent of L^AT_EX’s `\backslash`). For example, the `\topbot` command defined on page 105 could have been expressed as “`\moverlay{\top\cr\bot}`” and the `\neswarow` command defined on the previous page 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 T_EXbook [Knu86a] for explanations of the T_EX primitives used by `\moverlay`.

Modifying L^AT_EX-generated symbols

Oftentimes, symbols composed in the L^AT_EX 2 _{ε} source code can be modified with minimal effort to produce useful variations. For example, `fontdef.dtx` composes the `\ddots` symbol (see Table 189 on page 63) 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 L^AT_EX 2 _{ε} shortcut for “pt” or “1.0pt”. The remaining commands are defined in The T_EXbook [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.

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 pdfT_EX writes his name as “Hàn Thé Thành”. The `dblaccnt` package enables L^AT_EX to stack accents, as in “H\`an Th\`e Th\`anh” (albeit not in the OT1 font encoding). In addition, the `wsipa` 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 “ř”. See the `wsipa` 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 “ \acute{f} ” and `\accentset{e}{X}` produces “ \hat{X} ”. `\underaccent` does the same thing, but places the accent beneath the character. This enables constructs like `\underaccent{\tilde}{V}`, which produces “ \tilde{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 L^AT_EX’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 L^AT_EX's `\stackrel` command, which stacks one mathematical expression (slightly reduced in size) atop another. Hence, “`\stackrel{a}{\rightarrow}`” produces “ $\overset{a}{\rightarrow}$ ” and “`X \stackrel{\text{definition}}{\rightarrow} Y`” produces “ $X \overset{\text{definition}}{\equiv} Y$ ”.

If all that needs to extend are horizontal and vertical lines—as opposed to repeated symbols such as the “=” in the previous example—L^AT_EX's `array` or `tabular` environments may suffice. Consider the following code (due to a February 1999 `comp.text.tex` post by Donald Arseneau and subsequent modifications by Billy Yu and Scott Pakin) for typesetting annuity and life-insurance symbols:

```
\DeclareRobustCommand{\actuarial}[2][]{%
 \def\arraystretch{0}%
 \setlength\arraycolsep{0.5pt}%
 \setlength\arrayrulewidth{0.5pt}%
 \setbox0=\hbox{$\scriptstyle#1#2$}%
 \begin{array}[b]{*2{c}}>{\scriptstyle}c|}%
 \cline{2-2}%
 \rule[1.25pt]{0pt}{\ht0}%
 #1 & #2%
 \end{array}%
 }
```

Using the preceding definition, one can type, e.g., “`$a_{\actuarial{n}}`” to produce “ $a_{\overline{n}}$ ” and “`$a_{\actuarial[x]{n}}`” to produce “ $a_{x:\overline{n}}$ ”

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{##\cr\cr\noalign{\kern3\p@}
 \downbracketfill\cr\cr\noalign{\kern3\p@\nointerlineskip}
 $ \hfil\displaystyle{#1}\hfil$\cr\cr}}}\limits}
\def\underbracket#1{\mathop{\vtop{\ialign{##\cr\cr
 $ \hfil\displaystyle{#1}\hfil$\cr\cr\noalign{\kern3\p@\nointerlineskip}
 \upbracketfill\cr\cr\noalign{\kern3\p@}}}}\limits}
\def\overparenthesis#1{\mathop{\vbox{\ialign{##\cr\cr\noalign{\kern3\p@}
 \downparenthfill\cr\cr\noalign{\kern3\p@\nointerlineskip}
 $ \hfil\displaystyle{#1}\hfil$\cr\cr}}}\limits}
\def\underparenthesis#1{\mathop{\vtop{\ialign{##\cr\cr
 $ \hfil\displaystyle{#1}\hfil$\cr\cr\noalign{\kern3\p@\nointerlineskip}
 \upparenthfill\cr\cr\noalign{\kern3\p@}}}}\limits}
\def\downparenthfill{$\m@th\braceleft\leaders\vrule\hfill\braceright$}
\def\upparenthfill{$\m@th\bracel\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 324 showcases these accents. The `\TeXbook` [Knu86a] or another book on `\TeX` primitives is indispensable 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., `\braceleft` [“ \lrcorner ”] for `\downparenthfill`), a horizontal rule that stretches as wide as possible, and a right symbol (e.g., `\braceright` [“ \urcorner ”] for `\upparenthfill`). `\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 324: Manually Composed Extensible Accents

\overbrace{abc}	<code>\overbracket{abc}</code>	\overbrace{abc}	<code>\overparenthesis{abc}</code>
\underbrace{abc}	<code>\underbracket{abc}</code>	\underbrace{abc}	<code>\underparenthesis{abc}</code>

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

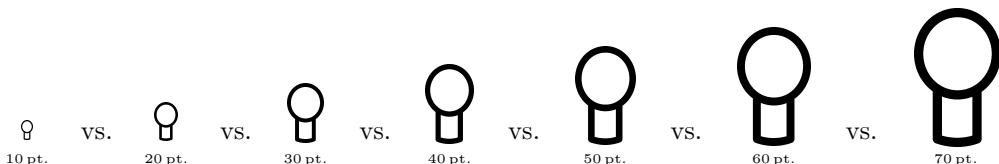


See the `simplewick` documentation for more information.

Developing new symbols from scratch

Sometimes it is 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. You may also want to read the freely available `METAFONT` primer located at <http://metafont.tutorial.free.fr/>. The following is an extremely brief tutorial on how to create a new `LAT\TeX` symbol using `METAFONT`. Its primary purpose is to cover the `LAT\TeX`-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 (“Q”).¹¹ 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 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:



`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 Figure 2 and Figure 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.

¹¹I'm not a very good artist; you'll have to pretend that “Q” looks like a light bulb.

```

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`)

```

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);                                %  $z_1$  is at the top of a circle.
  rt z2 = (w + sb + o - x4, y4);                        %  $z_2$  is at the same height as  $z_4$  but the opposite side.
  bot z3 = (z1 - (0, w - sb - o));                      %  $z_3$  is at the bottom of the circle.
  lft z4 = (sb - o, 1/2[y1, y3]);                       %  $z_4$  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;                            %  $z_5$  lies on the bulb, a little to the right of  $z_3$ .
  z6 = (x5, 0);                                         %  $z_6$  is at the bottom, directly under  $z_5$ .
  z7 = (x8, 0);                                         %  $z_7$  is at the bottom, directly under  $z_8$ .
  z8 = point 2 + 1/3 of bulb;                            %  $z_8$  lies on the bulb, a little to the left of  $z_3$ .
  bot z67 = (1/2[x6, x7], pen_bot - o - 1/8pt);        %  $z_{67}$  lies halfway between  $z_6$  and  $z_7$  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`)

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, \dots, z_8 and z_{67} , which `lightbulb.mf` defines to lie between z_6 and z_7 .

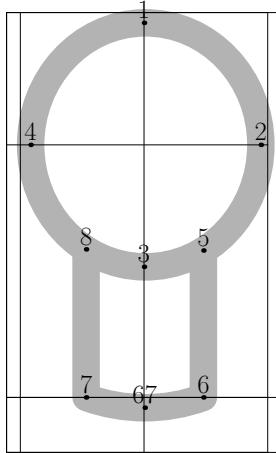


Figure 4: Proof diagram of `lightbulb10.mf`

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
[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).

The LightBulb10 font is now usable by TeX. L^AT_EX 2 _{ε} , however, needs more information before documents can use the font. First, we create a font-description file that tells L^AT_EX 2 _{ε} 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 “L^AT_EX 2 _{ε} 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 L^AT_EX 2 _{ε} request for a U-encoded version of `bulb` with a (m)edium font

Test of lightbulb10 on March 11, 2003 at 1127								
	'0	'1	'2	'3	'4	'5	'6	'7
'10x		♀						
'11x								
	"8	"9	"A	"B	"C	"D	"E	"F

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

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

Figure 6: L^AT_EX 2_ε font-description file (`ubulb.fd`)

series (as opposed to, e.g., bold) and a (n)ormal font shape (as opposed to, e.g., italic) should translate into a T_EX request for `lightbulb10.tfm` mechanically scaled to the current font size.

The final step is to write a L^AT_EX 2_ε 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: L^AT_EX 2_ε 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.

8.4 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 L^AT_EX [Dow00] for a nice exposition on the subject.) To use a symbol for a different purpose, you can use the T_EX 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 T_EXbook [Knu86a] for the definitive description of math-mode spacing.

The purpose of the “log-like symbols” in Table 128 and Table 129 is to provide the correct amount of spacing around and within multiletter function names. Table 325 on the following page 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 ” as part of a displayed formula.

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

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

TABLE 325: Spacing Around/Within Log-like Symbols

L ^A T _E X expression	Output
<code>\$r \sin \theta\$</code>	$r \sin \theta$ (best)
<code>\$r \sin \theta\$</code>	$r \sin \theta$
<code>\$r \mbox{\sin} \theta\$</code>	$r \sin \theta$
<code>\$r \mathrm{\sin} \theta\$</code>	$r \sin \theta$

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 T_EX 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 326 contrasts symbols declared with `\DeclareMathOperator` and `\DeclareMathOperator*` in both text style (\$...\$) and display style (`\[...]`).¹²

TABLE 326: Defining new log-like symbols

Declaration function	<code>\$\newlogsym_{p \in P}\$</code>	<code>\[\newlogsym_{p \in P} \]</code>
<code>\DeclareMathOperator</code>	$\text{newlogsym}_{p \in P}$	$\text{newlogsym}_{p \in P}$
<code>\DeclareMathOperator*</code>	$\text{newlogsym}_{p \in P}$	$\text{newlogsym}_{p \in P}$

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 129 utilize this spacing convention.

8.5 Bold mathematical symbols

L^AT_EX 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/texfaq2html?label=boldgreek> can be used to produce bold mathematical symbols. Table 327 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 327: Producing bold mathematical symbols

Package	Code	Output
<i>none</i>	<code>\$\alpha + b = \Gamma \div D\$</code>	$\alpha + b = \Gamma \div D$ (no bold)
<i>none</i>	<code>\$\mathbf{\alpha} + b = \Gamma \div D\$</code>	$\alpha + \mathbf{b} = \Gamma \div D$
<i>none</i>	<code>\boldsymbol{\alpha} + b = \Gamma \div D\$</code>	$\alpha + \mathbf{b} = \Gamma \div D$
<i>amsbsy</i>	<code>\$\pmb{\alpha} + b = \Gamma \div D\$</code>	$\alpha + \mathbf{b} = \Gamma \div D$ (faked bold)
<i>amsbsy</i>	<code>\$\boldsymbol{\alpha} + b = \Gamma \div D\$</code>	$\alpha + \mathbf{b} = \Gamma \div D$
<i>bm</i>	<code>\$\bm{\alpha} + b = \Gamma \div D\$</code>	$\alpha + \mathbf{b} = \Gamma \div D$
<i>fixmath</i>	<code>\$\mathbf{\alpha} + b = \Gamma \div D\$</code>	$\alpha + \mathbf{b} = \Gamma \div D$

¹²Note that `\displaystyle` can be used to force display style within `$...$` and `\textstyle` can be used to force text style within `\[...]`.

8.6 ASCII and Latin 1 quick reference

Table 328 amalgamates data from various other tables in this document into a convenient reference for L^AT_EX 2 _{ε} 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 L^AT_EX 2 _{ε} command to typeset the character as a text character. And the fourth column lists the L^AT_EX 2 _{ε} command to typeset the character within a `\texttt{...}` command (or, more generally, when `\ttfamily` is in effect).

TABLE 328: L^AT_EX 2 _{ε} ASCII Table

Dec	Hex	Char	Body text	<code>\texttt{...}</code>	Dec	Hex	Char	Body text	<code>\texttt{...}</code>
33	21	!	!	!	62	3E	>	<code>\textgreater</code>	>
34	22	"	<code>\textquotedbl</code>	"	63	3F	?	?	?
35	23	#	<code>\#</code>	<code>\#</code>	64	40	@	<code>\text{@}</code>	@
36	24	\$	<code>\\$</code>	<code>\\$</code>	65	41	A	A	A
37	25	%	<code>\%</code>	<code>\%</code>	66	42	B	B	B
38	26	&	<code>\&</code>	<code>\&</code>	67	43	C	C	C
39	27	,	,	,	68	44	:	:	:
40	28	(((69	45	Z	Z	Z
41	29)))	70	46	[[[
42	2A	*	*	*	71	47	\	<code>\textbackslash</code>	<code>\char`\\</code>
43	2B	+	+	+	72	48]]]
44	2C	,	,	,	73	49	^	<code>\^{}{}</code>	<code>\^{}{}</code>
45	2D	-	-	-	74	50	_	<code>_</code>	<code>\char`_</code>
46	2E	.	.	.	75	51	'	'	'
47	2F	/	/	/	76	52	a	a	a
48	30	0	0	0	77	53	b	b	b
49	31	1	1	1	78	54	c	c	c
50	32	2	2	2	79	55	:	:	:
⋮	⋮	⋮	⋮	⋮	80	56	z	z	z
57	39	9	9	9	81	57	{	<code>\{</code>	<code>\char`{\</code>
58	3A	:	:	:	82	58		<code>\textbar</code>	
59	3B	;	;	;	83	59	}	<code>\}</code>	<code>\char`}</code>
60	3C	<	<code>\textless</code>	<	84	5A	~	<code>\~{}{}</code>	<code>\~{}{}</code>
61	3D	=	=	=	85	5B			

The following are some additional notes about the contents of Table 328:

- “” is not available in the OT1 font encoding.
- Table 328 shows a close quote for character 39 for consistency with the open quote shown for character 96. A straight quote can be typeset using `\textquotesingle` (cf. Table 40).
- The characters “<”, “>”, and “|” do work as expected in math mode, although they produce, respectively, “ \langle ”, “ \rangle ”, and “ \mid ” in text mode when using the OT1 font encoding.¹³ 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 “ \langle filename \rangle ”.

¹³Donald Knuth didn't think such symbols were important outside of mathematics so he omitted them from his text fonts.

- Although “/” does not require any special treatment, L^AT_EX 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 67 on page 30), which produces a somewhat wide “~”, or the `textcomp` package’s `\texttildebelow` (shown in Table 40 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 T_EX world. If your goal is to typeset tildes in URLs or 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 227 on page 72.
- 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 328, Table 329 on the next page is an amalgamation of data from other tables in this document. While Table 328 shows how to typeset the 7-bit ASCII character set, Table 329 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 329:

- 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 17 on page 14 plus an empty argument. For instance, `\={}` is essentially the same as `\textasciimacron`.
- The commands in the “L^AT_EX 2_E” 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 L^AT_EX’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 330 presents the characters with which CP1252 augments the standard Latin 1 table.

The following are some additional notes about the contents of Table 330:

- As in Table 329, 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`.

TABLE 329: LATEX 2 ϵ Latin 1 Table

Dec	Hex	Char	LATEX 2 ϵ		Dec	Hex	Char	LATEX 2 ϵ
161	A1	¡	!‘		209	D1	Ñ	\~{N}
162	A2	¢	\textcent	(tc)	210	D2	Ò	\'{O}
163	A3	£	\pounds		211	D3	Ó	\'{O}
164	A4	¤	\textcurrency	(tc)	212	D4	Ô	\^{O}
165	A5	¥	\textyen	(tc)	213	D5	Õ	\~{O}
166	A6	¦	\textbrokenbar	(tc)	214	D6	Ö	\"^{O}
167	A7	§	\S		215	D7	×	\texttimes (tc)
168	A8	„	\textasciidieresis	(tc)	216	D8	Ø	\o
169	A9	©	\textcopyright		217	D9	Ù	\'{U}
170	AA	ª	\textordfeminine		218	DA	Ú	\'{U}
171	AB	«	\guillemotleft	(T1)	219	DB	Û	\^{U}
172	AC	¬	\textlnot	(tc)	220	DC	Ü	\\"^{U}
173	AD	-	\-		221	DD	Ý	\'{Y}
174	AE	®	\textregistered		222	DE	Þ	\textTH (T1)
175	AF	—	\textasciimacron	(tc)	223	DF	ß	\ss
176	B0	°	\textdegree	(tc)	224	E0	à	\'{a}
177	B1	±	\textpm	(tc)	225	E1	á	\'{a}
178	B2	²	\texttwosuperior	(tc)	226	E2	â	\^{a}
179	B3	³	\textthreesuperior	(tc)	227	E3	ã	\~{a}
180	B4	‘	\textasciacute	(tc)	228	E4	ä	\\"^{a}
181	B5	µ	\textmu	(tc)	229	E5	å	\aa
182	B6	¶	\P		230	E6	æ	\ae
183	B7	.	\textperiodcentered		231	E7	ç	\c{c}
184	B8	,	\c{c}		232	E8	è	\'{e}
185	B9	í	\textonesuperior	(tc)	233	E9	é	\'{e}
186	BA	º	\textordmasculine		234	EA	ê	\^{e}
187	BB	»	\guillemotright	(T1)	235	EB	ë	\\"^{e}
188	BC	¼	\textonequarter	(tc)	236	EC	ì	\'{i}
189	BD	½	\textonehalf	(tc)	237	ED	í	\'{i}
190	BE	¾	\textthreequarters	(tc)	238	EE	î	\^{i}
191	BF	¿	?‘		239	EF	ï	\\"^{i}
192	C0	À	\'{A}		240	F0	ð	\dh (T1)
193	C1	Á	\'{A}		241	F1	ñ	\~{n}
194	C2	Â	\^{A}		242	F2	ò	\'{o}
195	C3	Ã	\~{A}		243	F3	ó	\'{o}
196	C4	Ä	\\"^{A}		244	F4	ô	\^{o}
197	C5	Å	\AA		245	F5	õ	\~{o}
198	C6	Æ	\AE		246	F6	ö	\\"^{o}
199	C7	Ҫ	\c{C}		247	F7	÷	\textdiv (tc)
200	C8	È	\'{E}		248	F8	ø	\o
201	C9	É	\'{E}		249	F9	ù	\'{u}
202	CA	Ê	\^{E}		250	FA	ú	\'{u}
203	CB	Ë	\\"^{E}		251	FB	û	\^{u}
204	CC	Ì	\'{I}		252	FC	ü	\\"^{u}
205	CD	Í	\'{I}		253	FD	ý	\'{y}
206	CE	Î	\^{I}		254	FE	þ	\th (T1)
207	CF	Ï	\\"^{I}		255	FF	ÿ	\\"^{y}
208	D0	Ð	\DH	(T1)				

TABLE 330: L^AT_EX 2 _{ε} Code Page 1252 Table

Dec	Hex	Char	L ^A T _E X 2 _{ε}		Dec	Hex	Char	L ^A T _E X 2 _{ε}
128	80	€	\texteuro	(tc)	145	91	‘	‘
130	82	,	\quotesinglbase	(T1)	146	92	’	’
131	83	f	\textit{f}		147	93	“	“
132	84	„	\quotedblbase	(T1)	148	94	”	”
133	85	…	\dots		149	95	•	\textbullet
134	86	†	\dag		150	96	—	--
135	87	‡	\ddag		151	97	—	---
136	88	^	\textasciicircum		152	98	~	\textasciitilde
137	89	%	\textperthousand	(tc)	153	99	™	\texttrademark
138	8A	Š	\v{S}		154	9A	š	\v{s}
139	8B	⟨	\guilsinglleft	(T1)	155	9B	⟩	\guilsinglright (T1)
140	8C	Œ	\OE		156	9C	œ	\oe
142	8E	Ž	\v{Z}		158	9E	ž	\v{z}
					159	9F	Ÿ	\"{"Y}

While too large to incorporate into this document, a listing of ISO 8879:1986 SGML/XML character entities and their L^AT_EX equivalents is available from <http://www.bitjungle.com/~isoent/>. Some of the characters presented there make use of `isoent`, a L^AT_EX 2 _{ε} package (available from the same URL) that fakes some of the missing ISO glyphs using the L^AT_EX `picture` environment.¹⁴

8.7 Unicode characters

Unicode is a “universal character set”—a standard for encoding (i.e., assigning unique numbers to) the symbols appearing in many of the world’s languages. While ASCII can represent 128 symbols and Latin 1 can represent 256 symbols, Unicode can represent an astonishing 1,114,112 symbols.

Because T_EX and L^AT_EX predate the Unicode standard and Unicode fonts by almost a decade, support for Unicode has had to be added to the base T_EX and L^AT_EX systems. Note first that L^AT_EX distinguishes between *input* encoding—the characters used in the `.tex` file—and *output* encoding—the characters that appear in the generated `.dvi`, `.pdf`, etc. file.

Inputting Unicode characters

To include Unicode characters in a `.tex` file, load the `ucs` package and load the `inputenc` package with the `utf8x` (“UTF-8 extended”) option.¹⁵ These packages enable L^AT_EX to translate UTF-8 sequences to L^AT_EX commands, which are subsequently processed as normal. For example, the UTF-8 text “Copyright © 2009”—“©” is not an ASCII character and therefore cannot be input directly without packages such as `ucs`/`inputenc`—is converted internally by `inputenc` to “Copyright \textcopyright{} 2009” and therefore typeset as “Copyright © 2009”.

The `ucs`/`inputenc` combination supports only a tiny subset of Unicode’s million-plus symbols. Additional symbols can be added manually using the `\DeclareUnicodeCharacter` command. `\DeclareUnicodeCharacter` takes two arguments: a Unicode number and a L^AT_EX command to execute when the corresponding Unicode character is encountered in the input. For example, the Unicode character “degree celsius” (“°C”) appears at character position U+2103.¹⁶ However, “°” is not one of the characters that `ucs` and `inputenc` recognize. The following document shows how to use `\DeclareUnicodeCharacter` to tell L^AT_EX that the “°” character should be treated as a synonym for `\textcelsius`:

```
\documentclass{article}
\usepackage{ucs}
\usepackage[utf8x]{inputenc}
```

¹⁴`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.

¹⁵UTF-8 is the 8-bit Unicode Transformation Format, a popular mechanism for representing Unicode symbol numbers as sequences of one to four bytes.

¹⁶The Unicode convention is to express character positions as “U+*hexadecimal number*”.

```
\usepackage{textcomp}

\DeclareUnicodeCharacter{"2103}{\textcelsius} % Enable direct input of U+2103.

\begin{document}
It was a balmy 21°C.
\end{document}
```

which produces

It was a balmy 21°C.

See the `ucs` documentation for more information and for descriptions of the various options that control `ucs`'s behavior.

Outputting Unicode characters

Orthogonal to the ability to include Unicode characters in a `LATEX` input file is the ability to include a given Unicode character in the corresponding output file. By far the easiest approach is to use `XELATEX` instead of `pdfLATEX` or ordinary `LATEX`. `XELATEX` handles Unicode input and output natively and can utilize system fonts directly without having to expose them via `.tfm`, `.fd`, and other such files. To output a Unicode character, a `XELATEX` document can either include that character directly as UTF-8 text or use `TEX`'s `\char` primitive, which `XELATEX` extends to accept numbers larger than 255.

Suppose we want to output the symbols for versicle (“ V ”) and response (“ R ”) in a document. The Unicode charts list “versicle” at position U+2123 and “response” at position U+211F. We therefore need to install a font that contains those characters at their proper positions. One such font that is freely available from CTAN is Junicode Regular (`Junicode-Regular.ttf`) from the `junicode` package. The `fontspec` package makes it easy for a `XELATEX` document to utilize a system font. The following example defines a `\textjuni` command that uses `fontspec` to typeset its argument in Junicode Regular:

```
\documentclass{article}
\usepackage{fontspec}

\newcommand{\textjuni}[1]{\fontspec{Junicode-Regular}\#1}

\begin{document}
We use ``\textjuni{\char"2123}'' for a versicle
and ``\textjuni{\char"211F}'' for a response.
\end{document}
```

which produces

We use “ V ” for a versicle and “ R ” for a response.

(Typesetting the entire document in Junicode Regular would be even easier. See the `fontspec` documentation for more information regarding font selection.) Note how the preceding example uses `\char` to specify a Unicode character by number. The double quotes before the number indicate that the number is represented in hexadecimal instead of decimal.

8.8 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 (Table 44, Table 57, Table 67, Table 102, Table 128, Table 131, Table 152, Table 153, Table 164, Table 169, Table 201, 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 (Table 45, Table 68, Table 69, Table 105, Table 106, Table 132, Table 137, Table 148, and Table 202) and an initial Math Alphabets table (Table 213) were added thereafter. Later, Alexander Holt provided the `stmaryrd` tables (Table 46, Table 59, Table 70, Table 108, Table 125, and Table 149).

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, ancient languages, and other symbols, to provide a more user-friendly document structure
- an index, table of contents, hyperlinks, and a frequently-requested symbol list, to help users quickly locate symbols
- symbol tables rewritten to list the symbols in alphabetical order
- appendices providing additional information relevant to using symbols in L^AT_EX
- 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 Carlisle's original version. Most of the changes are geared towards making the document easier to extend, modify, and reformat.

Build characteristics Table 331 lists some of this document's build characteristics. Most important is the list of packages that L^AT_EX 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 332 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 331 or Table 332.

TABLE 331: Document Characteristics

Characteristic	Value
Source file:	<code>symbols.tex</code>
Build date:	November 9, 2009
Symbols documented:	5913
Packages included:	textcomp latexsym amssymb stmaryrd euscript wasysym pifont manfnt bbding undertilde ifsym tipa tipx extraipa wsuipa phonetic uly 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 hieroglif cclicenses mathdesign arev MnSymbol cml1 extpfeil keystroke fge turnstile simpsons epsdice feyn universal staves igo colonequals shuffle fourier dozenal pmboxdraw pigpen clock teubner linearA linearb cyprriot sarabian china2e harpoon steinmetz milstd recycle DotArrow ushort hhcount ogonek combelow accents nicefrac bm mathrsfs chancery calligra bbold mbboard dsfont bbm
Packages omitted:	<i>none</i>

TABLE 332: Package versions used in the preparation of this document

Name	Date
textcomp	2005/09/27
latexsym	1998/08/17

(continued on next page)

(continued from previous page)

Name	Date
amssymb	2002/01/22
stmaryrd	1994/03/03
euscript	2001/10/01
wasysym	2003/10/30
pifont	2005/04/12
manfnt	1999/07/01
bding	1999/04/15
undertilde	2000/08/08
ifsym	2000/04/18
tipa	2002/08/08
tipx	2003/01/01
wsuipa	1994/07/16
metre	2001/12/05
txfonts	2008/01/22
mathabx	2003/07/29
skak	2008/10/09
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	2008/08/01
phaistos	2004/04/23
arcs	2004/05/09
t4phonet	2004/06/01
semtrans	1998/02/10
dictsym	2004/07/26
extarrows	2008/05/15
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	2007/02/15
feyn	2008/02/29
universal	97/12/24
colonequals	2006/08/01
shuffle	2008/10/27
pmbboxdraw	2006/05/03
pigpen	2008/12/07
clock	2001/04/10
teubner	2008/02/10

(continued on next page)

(continued from previous page)

Name	Date
linearA	2006/03/13
linearb	2005/06/22
cypriot	1999/06/20
sarabian	2005/11/12
china2e	1997/06/01
harpoon	1994/11/02
steinmetz	2009/06/14
DotArrow	2007/02/12
ushort	2001/06/13
hhcount	1995/03/31
ogonek	95/07/17
combelow	2009/08/23
accents	2006/05/12
nicefrac	1998/08/04
bm	2004/02/26
calligra	1996/07/18

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The Comprehensive L^AT_EX Symbol List
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The current maintainer of this work is Scott Pakin.

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Index

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., "á" for "\'").

¹⁷ Some symbol entries appear to be listed repeatedly. This happens when multiple packages define identical (or nearly identical) glyphs with the same symbol name.

¹⁷This occurs frequently between `amssymb` and `mathabx`, for example.

Cypriot	86
Cyrillic	103
Greek	50, 51, 68, 87
Hebrew	51, 68
hieroglyphic	82
Linear A	82
Linear B	85
math	68
phonetic	11–14
proto-Semitic	81
South Arabian	87
Vietnamese	10
\alphaphaup (α)	50
alpine symbols	91
\Alt (Alt)	72
alternative denial	<i>see</i> \uparrow and \downarrow
\AltGr (AltGr)	72
\amalg (\amalg)	22
\amalg (\amalg)	23
\Amem (\sim)	81
ampersand	<i>see</i> \&
\AMS	8, 10, 22, 26, 30, 31, 36, 38, 39, 41, 49–54, 58, 59, 61, 64–66, 69, 100, 118
amsbsy (package)	113
amsfonts (package)	22, 30, 36, 41, 65, 68
amsmath (package)	8, 49, 58, 104, 112
amssymb (package)	8, 22, 30, 36, 41, 58, 65, 68, 87, 119, 120, 123
amstext (package)	105, 106
\Anaclasis (\div)	95
\anaclasis (\div)	95
\anceps (\times)	95
\ancepsdbrevi (\times)	95
\anchor (J)	80
ancient-language symbols	81–87
and	<i>see</i> \wedge
AND gates	73
	
\ANDd (AND)	73
	
\ANDl (AND)	73
	
\ANDr (AND)	73
	
\ANDu (AND)	73
\angle (\angle)	66
\angle (\angle)	65
\angle (\angle)	66
angle notation	70
angles	65–67
\AngleSign (\AA)	67
Ångström unit	
math mode	<i>see</i> \mathring{A}
text mode	<i>see</i> \AA
\Angud (\AA)	57
\angud (\AA)	57
angular minutes	<i>see</i> \prime
angular seconds	<i>see</i> \second
\Angus (\AA)	57
\angus (\AA)	57
animals	81, 82, 86
\Ankh (\AA)	90
annuity symbols	108
\Antidiple (<)	95
\antidiple (<)	95
\Antidiple* (<)	95
\antidiple* (<)	95
\antilabe (:)	64
\Antisigma (\Delta)	95
\antisigma (\Delta)	95
\Anun (\Delta)	81
\Ape (\Delta)	81
APL	
modifiers	71
symbols	71
\APLbox (\square)	71
\APLcirc (\blacksquare)	71
\APLcomment (a)	71
\APLdown (∇)	71
\APLdownarrowbox (\Downarrow)	71
\APLinput (\Box)	71
\APLInv (\boxdot)	71
\APLleftarrowbox (\boxleftarrow)	71
\APLlog (\otimes)	71
\APLminus (--)	71
\APLnot (\blacksquare)	71
\APLrightarrowbox (\boxrightarrow)	71
\APLstar (\star)	71
\APLup (Δ)	71
\APLuparrowbox (\Uparrow)	71
\APLvert (\Box)	71
\apprge (\gtrapprox)	38
\apprle (\lessapprox)	38
\approx (\approx)	30
\approx (\approx)	32
\approxcolon ($\approx:$)	36
\approxcoloncolon ($\approx::$)	36
\approxeq (\approx)	30
\approxeq (\approx)	32
\AQopf (∞)	81
\Aquarius ($\text{\textcircled{W}}$)	71
\aquarius ($\approx\text{\textcircled{W}}$)	71
\AR (\mathcal{R})	70
ar (package)	70, 119
arc ($\text{\textcircled{a}}$)	<i>see</i> accents
\arccos (arccos)	49
arcminutes	<i>see</i> \prime
arcs (package)	17, 119, 120
arcseconds	<i>see</i> \second
\arcsin (arcsin)	49
\arctan (arctan)	49
\Aresh ($\text{\textcircled{R}}$)	81
\arev (package)	67, 88, 119, 120
\arg (arg)	49
\Aries ($\text{\textcircled{Y}}$)	71
\Aries ($\text{\textcircled{Y}}$)	71
\aries ($\text{\textcircled{Y}}$)	71
\ArrowBoldDownRight ($\text{\textcircled{\text{\textcircled{P}}}}$)	75
\ArrowBoldRightCircled ($\text{\textcircled{\text{\textcircled{P}}}}$)	75
\ArrowBoldRightShort ($\text{\textcircled{P}}$)	75
\ArrowBoldRightStrobe ($\text{\textcircled{\text{\textcircled{P}}}}$)	75
\ArrowBoldUpRight ($\text{\textcircled{\text{\textcircled{P}}}}$)	75
\Arrownot ()/	48
\arrownot ()/	48
arrows	41–43, 47, 61–63, 72, 75, 81, 86, 90, 103
diagonal, for reducing subexpressions	59
dotted	63
double-headed, diagonal	106
extensible	59–63
fletched	47, 75
negated	41, 42, 44
\Arrowvert (\parallel)	54
	
\arrowvert (\parallel)	55
\arrowvert (\mid)	54
	
\arrowvert (\mid)	55
Arseneau, Donald	104, 106–108
\Asade ($\text{\textcircled{Y}}$)	81
\Asamekh ($\text{\textcircled{D}}$)	81
ASCII	8, 10, 72, 100, 114–115, 117, 119
table	114
ascii (package)	72, 115, 119, 120
\ascnode ($\text{\textcircled{Q}}$)	71
\Ashin (ω)	81
aspect ratio	70
\ast (*)	23
\ast (*)	22
\ast (*)	23
\Asteriscus ($\text{\textcircled{*}}$)	95
\asteriscus ($\text{\textcircled{*}}$)	95
\Asterisk (*)	23
\Asterisk ($\text{\textcircled{*}}$)	78
\asterisk (*)	23
\AsteriskBold ($\text{\textcircled{*}}$)	78
\AsteriskCenterOpen ($\text{\textcircled{*}}$)	78
\AsteriskRoundedEnds ($\text{\textcircled{*}}$)	78
asterisks	23, 78
\AsteriskThin ($\text{\textcircled{*}}$)	78
\AsteriskThinCenterOpen ($\text{\textcircled{*}}$)	78
\asterism ($\text{\textcircled{*}}$)	104
astrological symbols	71
astronomical symbols	71, 98
\astrosun (\odot)	71
\asmp (\approx)	30
\asmp (\approx)	48
\atan (atan)	113
\ataribox ($\text{\textcircled{Y}}$)	88
\Atav (+)	81
\Ateth ($\text{\textcircled{S}}$)	81
\AtForty ($\text{\textcircled{F}}$)	90
\AtNinetyFive ($\text{\textcircled{F}}$)	90
atomic math objects	49, 113
\AtSixty ($\text{\textcircled{F}}$)	90

\autoleftarrow (\leftarrow)	62
\autoleftrightharpoons ($\leftarrow\rightarrow$)	62
\autorightarrow (\rightarrow)	62
\autorightleftharpoons (\rightleftarrows)	62
\Avav (♀)	81
average	21
\Ayn (‘)	14
\Ayod (݂)	81
\Azayin (=)	81
B	
\B	10
\B (⌚)	95
b (esvect package option)	61
\b (✉)	14
\b (⌚)	95
\Ba (܍)	85
babel (package)	50, 87
\babygamma (ݚ)	13
\backapprox (ݘ)	32
\backapproxeq (ݘ)	32
\backcong (ݘ)	32
\backepsilon (܃)	30
\backeqsim (ݘ)	32
\backneg (ݘ)	66
\backprime (܍)	66
\backprime (܍)	66
\backsim (ݘ)	30
\backsim (ݘ)	32
\backsimeq (ݘ)	30
\backsimeq (ݘ)	32
\backslash (\\)	54, 65
\backslash (\\)	55
\backslash backslashdiv (ݘ)	23
\backslash backtriplesim (ݘ)	32
\Baii (܍)	85
\Baiii (܍)	85
banana brackets	
<i>see \llparenthesis and \rrparenthesis</i>	
\banceps (ݚ)	95
\bar (܍)	57
\barb (܍)	13
\barbbrevis (ݘ)	95
\barbrevis (ݘ)	95
\barcirc (܍)	104
\bard (܍)	13
\bari (܍)	13
\barin (܍)	52
\barj (܍)	13
\barl (܍)	13
\barlambda (܍)	13
\barleftharpoon (ݘ)	43
\baro (܍)	22
\baro (܍ vs. ܍)	101
\baro (܍)	13
\barp (܍)	13
barred letters	104
\barrightharpoon (ݘ)	43
\barsci (܍)	13
\barscu (܍)	13
	96
\Bart (܍)	96
\baru (܍)	13
\barwedge (ݘ)	23
\barwedge (ݘ)	22
base-twelve digits	65
\Bat (܍)	90
\Bau (܍)	85
\bauarrow (܍)	75
\baucircle (܍)	80
\baucircle (܍)	80
\baucross (܍)	77
\baudash (܍)	90
\baueclipse (܍)	80
\bauequal (܍)	90
\bauface (܍)	90
\bauforms (܍)	90
\bauforms (܍)	90
\bauhead (܍)	90
	90
\bauhole (܍)	80
\bauplus (܍)	90
\baupunct (܍)	80
\bauquarter (܍)	90
\bauquestion (܍)	90
\bausquare (܍)	80
\bausquare (܍)	80
\bautriangle (܍)	80
\bautriangle (܍)	80
\bauwhitearrow (܍)	75
\bauwindow (܍)	90
\BB (܍)	95
\bba (ݘ)	95
\bbalpha (܍)	68
\bbar (܍)	104
\bbb (܍)	95
\bbbeta (܍)	68
\Bbbk (܍)	52
bbding (package)	75–78, 80, 101, 119, 120
\bbdollar (\$)	68
\bbetter (܍)	93
\bbeuro (܍)	68
\bbfinalnun (܍)	68
\bbgamma (܍)	68
bbgreekl (mathbbol package option)	68
\BBm (܍)	95
\Bbm (܍)	95
\Bbm (܍)	95
bbm (package)	68, 119
\bbm (܍)	95
\bbmb (܍)	95
\bbmx (܍)	95
\bbnabla (܍)	68
bbold (package)	68, 119
\bbpe (܍)	68
\bbqof (܍)	68
\bbrevis (܍)	95
\bbslash (܍)	22
\bbyod (܍)	68
\bcontraction	109
\Bda (܍)	85
\Bde (܍)	85
\bdecisive (+)	93
\Bdi (܍)	85
\Bdo (܍)	85
\Bdu (܍)	85
\Bdwe (܍)	85
\Bdwo (܍)	85
\Be (܍)	85
\Beam (܍)	73
\Bearing (܍)	73
\because (܍)	30, 64
\because (܍)	64
\BEL (܍)	72
\bell (܍)	88
Berry, Karl	122
\beta (܍)	50
\betaup (܍)	50
\beth (܍)	51
\beth (܍)	51
\betteris (܍)	93
\between (܍)	32
\between (܍)	30
\between (܍)	32
\Bi (܍)	85
\bibridge (܍)	16
biconditional	
<i>see \leftrightharpoonup and \equiv</i>	
\Bicycle (܍)	90
\Big	100, 102
\big	100, 102
big O (܍)	<i>see alphabets, math</i>
\bigast (*)	23
	74
\bigbosonloop ()	74
\bigbosonloopA ()	74
	74
\bigbosonloopV ()	74
\bigbox (܍)	26
\bigboxasterisk (܍)	26
\bigboxbackslash (܍)	27
\bigboxbot (܍)	27
\bigboxcirc (܍)	27
\bigboxcoasterisk (܍)	27
\bigboxdiv (܍)	27
\bigboxdot (܍)	27
\bigboxleft (܍)	27
\bigboxminus (܍)	27
\bigboxplus (܍)	27

\bigboxright (□)	27	\bigotimes (⊗)	25	birds	82
\bigboxslash (☒)	26	\bigotimes (⊗)	29	bishop	94
\bigboxtimes (☒)	26	\bigotop (⊕)	26	\bishoppair (▣)	93
\bigboxtop (▣)	26	\bigotriangle (◎)	29	\Bja (𦵃)	85
\bigboxtriangleup (▣)	26	\bigotriangleup (Ⓐ)	26	\Bje (𦵄)	85
\bigboxvoid (□)	27	\bigovert (○)	29	\Bjo (߁)	85
\bigcap (∩)	25	\bigovoid (○)	27	\Bju (߂)	85
\bigcap (∩)	29	\bigparallel ()	26	\Bka (⊕)	85
\bigcapdot (⋈)	29	\bigparr (❀)	30	\Bke (❀)	85
\bigcapplus (⊕)	29	\bigplus (+)	27	\Bki (߁)	85
\bigcirc (○)	22	\bigplus (+)	29	\Bko (߁)	85
\bigcirc (○)	79	\BigRightDiamond (◆)	79	\Bku (߁)	85
\BigCircle (○)	79	\bigsqcap (⊓)	26	\BlackBishopOnBlack (♝)	94
\bigcircle (○)	29	\bigsqcap (⊓)	26	\BlackBishopOnWhite (♝)	94
\bigcoast (*)	23	\bigsqcap (⊓)	29	blackboard bold	see alphabets, math
\bigcomplementop (○)	27	\bigsqcapdot (⊔)	29	\blackdiamond (♦)	23
\BigCross (☒)	79	\bigsqcapplus (⊕)	27	\BlackEmptySquare (▢)	94
\bigcup (∪)	25	\bigsqcapplus (⊕)	29	\BlackKingOnBlack (♚)	94
\bigcup (∪)	29	\bigsqcup (⊔)	25	\BlackKingOnWhite (♚)	94
\bigcupdot (⋈)	29	\bigsqcup (⊔)	29	\BlackKnightOnBlack (♞)	94
\bigcupplus (⊕)	29	\bigsqcupdot (⋈)	29	\BlackKnightOnWhite (♞)	94
\bigcupplus (⋈)	29	\bigsqcupplus (⊕)	27	\blacklozenge (♦)	66
\bigcurlyvee (Ƴ)	26	\bigsqcupplus (⊕)	29	\blacklozenge (♦)	79
\bigcurlyvee (Ƴ)	26	\BigSquare (□)	79	\BlackPawnOnBlack (♟)	94
\bigcurlyvee (Ƴ)	29	\bigsquplus (⊓)	27	\BlackPawnOnWhite (♟)	94
\bigcurlyvedot (Ƴ)	29	\bigstar (★)	23	\BlackQueenOnBlack (♛)	94
\bigcurlywedge (⤠)	26	\bigstar (★)	66	\BlackQueenOnWhite (♛)	94
\bigcurlywedge (⤠)	26	\bigtimes (×)	27	\BlackRookOnBlack (♜)	94
\bigcurlywedge (⤠)	29	\bigtimes (×)	29	\BlackRookOnWhite (♜)	94
\bigcurlywedgedot (⤠)	29	\BigTriangleDown (▽)	79	\blacksmiley (☺)	88
\BigDiamondshape (◇)	79	\bigtriangledown (▽)	26	\blacksquare (■)	66
\bigdoublecurlyvee (Ƴ)	29	\bigtriangledown (▽ vs. ▽)	101	\blacksquare (■)	25
\bigdoublecurlywedge (⤠)	29	\bigtriangledown (▽)	22	\blackstone	94
\bigdoublevee (VV)	29	\bigtriangledown (▽)	40	\blacktriangle (▲)	66
\bigdoublewedge (⤠)	29	\BigTriangleLeft (◀)	79	\blacktriangle (▲)	40
\Bigg	100, 102	\BigTriangleRight (▶)	79	\blacktriangledown (▼)	25
\bigg	100, 102	\BigTriangleUp (△)	79	\blacktriangledown (▼)	66
\BigHBar (—)	79	\bigtriangleup (△)	26	\blacktriangleright (▶)	40
\biginterleave ()	26	\bigtriangleup (△ vs. △)	101	\blacktriangleright (▶)	25
\BigLowerDiamond (◆)	79	\bigtriangleup (△)	22	\blacktriangleleft (◀)	25
\bignplus (⊕)	26	\bigtriangleup (△)	40	\blacktriangleleft (◀)	39
\bigoast (⊗)	29	\biguplus (⊕)	25	\blacktriangleleft (◀)	40
\bigoasterisk (⊛)	27	\biguplus (⊕)	29	\blacktriangledown (▼)	39
\bigobackslash (⊗)	27	\bigvarstar (★)	23	\blacktriangledown (▼)	40
\bigobackslash (⊗)	29	\BigVBar ()	79	\blacktriangleright (▶)	25
\bigobot (⊕)	27	\bigvee (∨)	25	\blacktriangleright (▶)	39
\bigocirc (◎)	27	\bigvee (∨)	29	\blacktriangleright (▶)	40
\bigocirc (◎)	29	\bigveedot (VV)	29	\blacktriangleleft (◀)	25
\bigocoasterisk (⊛)	27	\bigwedge (∧)	25	\blacktriangleleft (◀)	39
\bigodiv (÷)	27	\bigwedge (∧)	29	\blacktriangleleft (◀)	40
\bigodot (○)	25	\bigwedgedot (Ⓐ)	29	\blacktriangleleft (◀)	40
\bigodot (○)	29	\bigwith (&)	30	\blacktriangleleft (◀)	40
\bigoleft (⊕)	27	\binampersand (&)	22	\blacktriangleleft (◀)	40
\bigominus (⊖)	27	binary operators ..	22–25	\blacktriangleleft (◀)	40
\bigominus (⊖)	29	binary relations ..	30–32, 34–39, 47, 48	\blacktriangleleft (◀)	40
\bigoplus (⊕)	25	negated	31–33	\blacktriangleleft (◀)	40
\bigoplus (⊕)	29	\bindnasrepma (❀)	22	\blacktriangleleft (◀)	40
\bigoslash (⊖)	26	\Biohazard (☣)	74	\blacktriangleleft (◀)	40
\bigoslash (⊖)	29	biological symbols ..	74	\blacktriangleup (▲)	25
\bigostar (⊗)	29				

blank	see \textblank	
\Bleech (\triangle)	90	
\blitza (\downarrow)	21, 48	
\blitzb (\downarrow)	48	
\blitzc (\downarrow)	48	
\blitzd (\downarrow)	48	
\blitze (\downarrow)	48	
block-element symbols	97	
\Bm (\trianglelefteq)	95	
bm (package)	113, 119, 121	
\bm	113	
\bm (\simeq)	95	
\Bma (\bowtie)	85	
\Bme (\pitchfork)	85	
\Bmi (\vee)	85	
\Bmo (∇)	85	
\bmod	49	
\Bmu (Γ^f)	85	
\Bna ($\bar{\gamma}$)	85	
\BNc (\circ)	85	
\BNcc (\circ)	85	
\BNccc ($\circ\circ$)	85	
\BNcd ($\circ\circ$)	85	
\BNcm ($\circ\circ\circ\circ$)	85	
\BNd ($\circ\circ$)	85	
\BNdc ($\circ\circ\circ$)	85	
\BNdcc ($\circ\circ\circ$)	85	
\BNdccc ($\circ\circ\circ\circ$)	85	
\Bne (\mp)	85	
\BNi ($'$)	85	
\Bni (γ)	85	
\BNii ($''$)	85	
\BNiii ($'''$)	85	
\BNiv ($^{ }$)	85	
\BNix ($^{ }$)	85	
\BNl ($\equiv\equiv$)	85	
\BNlx ($\equiv\equiv$)	85	
\BNlxx ($\equiv\equiv$)	85	
\BNlxxx ($\equiv\equiv$)	85	
\BNm (ϕ)	85	
\Bno (\mathbb{N}^s)	85	
\Bnu ($ S $)	85	
\BNv ($^{ }$)	85	
\BNvi ($^{ }$)	85	
\BNvii ($^{ }$)	85	
\BNviii ($^{ }$)	85	
\Bnwa ($\wedge\wedge$)	85	
\BNx ($_$)	85	
\BNxc ($\equiv\equiv$)	85	
\BNxl ($\equiv\equiv$)	85	
\BNxx ($=$)	85	
\BNxxx (\equiv)	85	
\Bo (\square)	85	
body-text symbols	9–20	
bold symbols	113	
\boldmath	113	
\boldsymbol	113	
\bomb (\bullet)	91	
Boolean domain (\mathbb{B})	see alphabets, math	
Boolean logic gates	73	
born	see \textborn	
bosons	74	
\bot (\perp)	21, 51, 105	
\bot (\bot)	52	
\botdoteq (\equiv)	32	
\Bouquet (\bowtie)	90	
\Bowtie (\bowtie)	88	
\bowtie (\bowtie)	30	
\bowtie (\bowtie)	23, 24	
\Box (\square)	65	
\Box (\square)	66	
\Box (\square)	25	
box-drawing symbols	97	
\boxast (\boxast)	22	
\boxasterisk (\boxast)	25	
\boxbackslash (\boxbackslash)	25	
\boxbackslash (\boxbackslash)	25	
\boxbar (\boxbar)	22	
\boxbot (\boxbot)	25	
\boxbox (\boxbox)	22	
\boxbox (\boxbox)	25	
\boxbslash (\boxbslash)	22	
\boxcirc (\boxcirc)	25	
\boxcircle (\boxcircle)	22	
\boxcoasterisk (\boxcoasterisk)	25	
\boxdiv (\boxdiv)	25	
\boxdot (\boxdot)	25	
\boxdot (\boxdot)	22	
\boxdot (\boxdot)	25	
\boxdotleft (\boxdotleft)	42	
\boxdotleft (\boxdotleft)	42	
\boxdotright (\boxdotright)	42	
\boxdotright (\boxdotright)	42	
\boxempty (\boxempty)	22	
\boxleft (\boxleft)	42	
\boxleft (\boxleft)	25	
\boxminus (\boxminus)	25	
\boxminus (\boxminus)	22	
\boxminus (\boxminus)	25	
\boxplus (\boxplus)	25	
\boxplus (\boxplus)	22	
\boxplus (\boxplus)	25	
\boxRight (\boxRight)	42	
\boxright (\boxright)	25	
\boxright (\boxright)	42	
\boxslash (\boxslash)	25	
\boxslash (\boxslash)	22	
\boxtimes (\boxtimes)	25	
\boxtimes (\boxtimes)	22	
\boxtimes (\boxtimes)	25	
\boxtimes (\boxtimes)	25	
\boxtop (\boxtop)	25	
\boxtriangleup (\boxtriangleup)	25	
\boxvert (\boxvert)	25	
\boxvoid (\boxvoid)	25	
\boy (δ)	71	
\Bpa (\ddagger)	85	
\Bpaiii (\boxplus)	85	
\BPamphora ($\ddot{\mathcal{O}}$)	86	
\BParrow (\gg)	86	
\BPbarley (γ)	86	
\BPbilly ($\ddot{\mathfrak{f}}$)	86	
\BPboar ($\ddot{\mathfrak{P}}$)	86	
\BPbronze (\boxminus)	86	
\BPbull ($\ddot{\mathfrak{f}}^t$)	86	
\BPCauldroni ($\ddot{\mathfrak{M}}$)	86	
\BPCauldronei ($\ddot{\mathfrak{M}}$)	86	
\BPCchariot ($\ddot{\mathfrak{E}}^t$)	86	
\BPCchassis ($\ddot{\mathfrak{D}}^t$)	86	
\BPCcloth ($\ddot{\mathfrak{M}}$)	86	
\BPCcow ($\ddot{\mathfrak{F}}^t$)	86	
\BPCcup ($\ddot{\mathfrak{C}}^t$)	86	
\BPe ($\ddot{\mathfrak{E}}$)	85	
\BPeve ($\ddot{\mathfrak{A}}$)	86	
\BPFoal ($\ddot{\mathfrak{N}}$)	86	
\BPGoat ($\ddot{\mathfrak{T}}$)	86	
\BPGoblet ($\ddot{\mathfrak{V}}$)	86	
\BPGold ($\ddot{\mathfrak{R}}$)	86	
\BPhorse ($\ddot{\mathfrak{K}}$)	86	
\BPIpi ($\ddot{\mathfrak{A}}$)	85	
\BPMan ($\ddot{\mathfrak{A}}$)	86	
\BPNanny ($\ddot{\mathfrak{I}}$)	86	
\BPOpo ($\ddot{\mathfrak{H}}$)	85	
\BPolive ($\ddot{\mathfrak{F}}$)	86	
\BPOx ($\ddot{\mathfrak{F}}^t$)	86	
\BPPig ($\ddot{\mathfrak{P}}$)	86	
\BPRam ($\ddot{\mathfrak{F}}^t$)	86	
\BPSheep ($\ddot{\mathfrak{T}}$)	86	
\BPsow ($\ddot{\mathfrak{P}}$)	86	
\BPspear ($\ddot{\mathfrak{S}}$)	86	
\BPsword ($\ddot{\mathfrak{A}}$)	86	
\BPTalent ($\ddot{\mathfrak{A}}\ddot{\mathfrak{A}}$)	85	
\Bpte ($\ddot{\mathfrak{U}}$)	85	
\Bpu ($\ddot{\mathfrak{P}}$)	85	
\Bpuii ($\ddot{\mathfrak{H}}$)	85	
\Bpvola ($\ddot{\mathfrak{C}}$)	85	
\Bpvolt ($\ddot{\mathfrak{f}}$)	85	
\Bpvold ($\ddot{\mathfrak{T}}$)	85	
\Bpvoldcf ($\ddot{\mathfrak{f}}$)	85	
\Bpwheat ($\ddot{\mathfrak{F}}$)	86	
\Bpwheel ($\ddot{\mathfrak{S}}$)	86	
\Bpwine ($\ddot{\mathfrak{R}}$)	86	
\Bpwineiih ($\ddot{\mathfrak{V}}$)	86	
\Bpwineiiih ($\ddot{\mathfrak{V}}^t$)	86	
\Bpwineivh ($\ddot{\mathfrak{V}}^t$)	86	
\Bpwoman ($\ddot{\mathfrak{A}}$)	86	
\Bpwool ($\ddot{\mathfrak{M}}$)	86	

\BPwta (↑)	85
\BPwtb (↓)	85
\BPwtc (#)	85
\BPwtd (§)	85
\Bqa (Φ)	85
\Bqe (Ξ)	85
\Bqi (Τ)	85
\Bqo (Π)	85
\Bra (L)	85
bra	54
\braceleft ({)	109
\bracerd (⟨)	109
\bracevert ()	54
\bracevert ()	55
brackets	see delimiters
\Braii (Π)	85
\Braiii (Ψ)	85
braket (package)	54
\Bre (Ψ)	85
\Break (Break)	72
\breve (ˇ)	57
\breve (˘)	17
breve (˘)	see accents
\brevis (˘)	95
\Bri (Ά)	85
\Bro (†)	85
\Broii (⊕)	85
\brokenvert ()	88
Bronger, Torsten	105
\Bru (՞)	85
\BS (¤)	72
\Bsa (՞)	85
\Bse (՞)	85
\BSEfree (¤)	74
\Bsi (Մ)	85
\Bso (՞)	85
\BSpace (◀▶)	72
\Bsu (Բ)	85
\Bswa (Վ)	85
\Bswi (Վ)	85
\Bta (Հ)	85
\Btaii (Վ)	85
\Bte (Ֆ)	85
\Bti (Բ)	85
\Bto (Թ)	85
\Btu (Փ)	85
\Btwe (Բ)	86
\Btwo (Ո)	85
\Bu (Ֆ)	85
\BUFd (▽)	73
buffers	73
\BUFl (◁)	73

\BUFr (▷)	73
\BUFu (△)	73
\BUI (♂)	86
\BUIi (♂)	86
\BUIii (♂)	86
\BUiv (♀)	86
\BUix (♂)	86
\bullet (•)	22
\bullet (•)	23
bullseye	see \textbullseye
\Bumpedeq (≈)	32
\bumpedeq (≈)	32
\Bumpeq (≈)	30
\Bumpeq (≈)	33
\bumpeq (≈)	30
\bumpeq (≈)	33
\bupperhand (±)	93
	
\Burns (Burns)	96
\BusWidth (↗)	73
\BUV (♪)	86
\BUVi (❀)	86
\BUXi (↳)	86
\BUXi (β)	86
\Bwa (ዋ)	85
\Bwe (ጀ)	85
\Bwi (ፌ)	85
\Bwo (ፌ)	85
\Bza (ፌ)	85
\Bze (ጀ)	85
\Bzo (ፌ)	85
C	
\c ()	95
c (esvect package option) . . .	61
\c (¤)	14, 116
\c ()	95
\Ca (">*	86
calligra (package)	68, 119, 121
Calligra (font)	68
calrsfs (package)	68
\CAN (↑)	72
cancel (package)	59
\Cancer (♋)	71
\cancer (♋)	71
\Cap (∩)	22
\Cap (∩)	24
\cap (∩)	23
\cap (∩)	22
\cap (∩)	23
\capdot (∩)	23
\capplus (⊕)	23
\Capricorn (♑)	71

\capricornus (♑)	71
\capturesymbol (×)	93
card suits	65–67, 80
cardinality	see \aleph
care of (%)	67
caret	see \^
Carlisle, David	1, 118, 119
caron (ˇ)	see accents
carriage return	72, 80, 103
\carriagereturn (↵)	80
Cartesian product	see \times
castle	94
\castlingchar (O)	93
\castlinghyphen (-)	93
\catal (⤵)	95
\Catalexis (⤵)	95
\catalexis (⤵)	95
catamorphism	
.	see \lparenthesis and \rparenthesis
\cb (█)	17
\Cc (██)	95
\cc (██)	95
\ccby (BY)	19
\Ccc (███)	95
cclicenses (package)	19, 119, 120
\ccnc (⊗)	19
\ccnd (◐)	19
\ccsa (⌚)	19
\cdot (·)	22, 104
\cdot (·)	23, 64
\cdotop (·)	63
\cdotop (·)	64
\cdots (…)	63
\Ce (✳)	86
Cedi	see \textcolonmonetary
cedilla (ˇ)	see accents
celestial bodies	71, 98
\celsius (°C)	70
\Celtcross (⊛)	90
\cent (¢)	18
\centerdot (▪)	23
\centerdot (.)	22
centernot (package)	105
\centernot	105
centigrade	see \textcelsius
\centre (田)	93
cents	see \textcent
\CEsign (€)	74
\Cga (>X)	86
chancery (package)	119
\changenotsign	32
\char	8, 103, 112, 115, 118
Charter (font)	18, 30
\checkmark (✓)	57
check marks	10, 66, 77, 80, 88, 90, 101
\checked (✓)	88
\CheckedBox (☒)	77
\Checkedbox (☒)	90
\Checkmark (✓)	77

\checkmark (✓)	10
\checkmark (✓)	66
\checkmark (✓ vs. ✓)	101
\checkmark (✓)	80
\CheckmarkBold (✓)	77
\checksymbol (+)	93
chemarr (package)	62, 119, 120
chemarrow (package)	47, 62, 119
\chemarrow (→)	47
Chen, Raymond	122
chess symbols	93, 94
\chesscomment (RR)	93
\chessetc ()	93
\chesssee (—)	93
\chi (χ)	50
china2e (package)	19, 49, 68, 98, 119, 121
\chiup (χ)	50
\ci (✗)	86
cipher symbols	98
\circ (○)	22, 67, 105
\circ (○)	23
\circeq (⊐)	32
\circeq (⊎)	30
\circeq (⊎)	33
\CIRCLE (●)	88
\Circle (○)	79
\Circle (○ vs. ○)	101
\Circle (○)	88
\circlearrowleft (↺)	42
\circlearrowleft (○)	41
\circlearrowleft (○)	44
\circlearrowright (↻)	42
\circlearrowright (○)	41
\circlearrowright (○)	44
circled numbers	77, 94
\CircledA (Ⓐ)	90
\circledast (⊛)	22
\circledast (⊛)	25
\circledbar (◐)	23
\circledbslash (◑)	23
\circledcirc (◎)	22
\circledcirc (◎)	25
\circleddash (⊖)	22
\circleddash (⊖)	25
\circleddot see \odot	
\circleddotleft (↔○)	42
\circleddotright (○↔)	42
\circledgtr (◎)	31
\circledless (⊖)	31
\circledminus see \ominus	
\circleddotleft see \circleddotleft	
\circleddotright see \circleddotright	
\circledplus see \oplus	
\circledR (Ⓡ)	10, 52
\circledS (Ⓢ)	52
\circledslash see \oslash	
\circledtimes see \otimes	
\circledvee (◎)	23
\circledwedge (◎)	23
\circleleft (←○)	42
\circleright (○→)	42
circles	79–80, 88, 94
\CircleShadow (○)	80
\CircleSolid (●)	80
\Circpipe (○)	73
\circcplus (†)	23
\Circsteel (●)	73
circumflex (˜) see accents	
\circumflexus (˜)	17
\Cja (◊)	86
\Cjo (◊)	86
\Cka (↑)	86
\Cke (✗)	86
\Cki (✗)	86
\Cko (∏)	86
\Cku (✗)	86
\Cla (▽)	86
\Cle (8)	86
\CleaningA (Ⓐ)	90
\CleaningF (Ⓕ)	90
\CleaningFF (Ⓕ)	90
\CleaningP (Ⓟ)	90
\CleaningPP (Ⓟ)	90
\Cli (≤)	86
\clickb (○)	13
\clickc (○)	13
\clickt (↑)	13
\Clo (+)	86
clock (package)	92, 119, 120
\clock (⌚)	92
\clock (⌚)	88
clock symbols	88, 90–92
\ClockFramefalse	92
\ClockFrametrue	92
\Clocklogo (⌚)	90
\ClockStyle	92
\clocktime	92
\closedcurlyvee (߻)	24
\closedcurlywedge (߸)	24
\closedequal (⊐)	33
\closedniomega (ߴ)	13
\closedprec (≺)	33
\closedreverseslash (ߵ)	13
\closedsucc (߷)	33
\Cloud (܂)	91
clovers	78
\Clu (܂)	86
clubs (suit)	65–67, 80
\clubsuit (♣)	65
\clubsuit (♦)	66
\Cma (☒)	86
\Cme (☒)	86
\Cmi (▽)	86
cmll (package)	21, 24, 30, 36, 119
\Cmo (܂)	86
\Cmu (☒)	86
\Cna (܂)	86
\Cne (܃)	86
\Cni (܄)	86
\Cno (܅)	86
\Cnu (܆)	86
\Co (܇)	86
\coAsterisk (*)	23
\coasterisk (*)	23
code page 1252	115
table	117
code page 437	72, 97, 115
\Coffeecup (܃)	90
\coh (܃)	36
coins, ancient	19
\colon	63
\colon (:)	63
\colon (:)	64
\Colonapprox (≈)	31
\Colonapprox (≈)	34
\colononapprox (≈)	36
\colononapprox (≈)	34
\colononapprox (≈)	31
\colononcolon (::)	36
\colononcolonapprox (::≈)	36
\colononcolonequals (::=)	36
\colononcolonminus (::−)	36
\colononcolonsim (::~)	36
\Coloneq (:=)	31
\Coloneq (:=)	34
\coloneq (:=)	21, 32
\coloneq (:=)	34
\coloneq (:=)	31
\coloneq (:=)	33
\Coloneqq (:=)	31
\Coloneqq (:=)	34
\coloneqq (:=)	34
\coloneqq (:=)	21, 31
colonequals (package)	21, 36, 119, 120
\colonequals (:=)	21, 36
\colonminus (:=)	36
\Colonsim (::~)	31
\Colonsim (::~)	34
\colonsim (::~)	36
\colonsim (::~)	34
\colonsim (::~)	31
combelow (package)	17, 119, 121
combinatorial logic gates	73
comma–below accent (܂) see accents	
communication symbols	73
commutative diagrams	106
comp.text.tex (newsgroup)	8, 21, 22, 103–108
\compensation (܂)	93
\complement (○)	52
\complement (○)	52
\complement (○)	29
complete shuffle product (܂)	24
\COMPLEX (܂)	49
\Complex (܂)	49

complex numbers (\mathbb{C})	see alphabets, math
composed accents	14
Comprehensive TeX Archive Network	1, 8, 59, 69, 100, 117–119
computer hardware symbols .	72
computer keys	72
Computer Modern (font)	100, 102, 115
\ComputerMouse (✉)	72
\cong (\cong)	30
\cong (\cong)	33
congruent	see \equiv
\conjunction (\wp)	71
conjunction, logical	see \wedge and \&
consequence relations	35
contradiction symbols	21, 48
control characters	72
converse implication	see \leftarrow and \subset
converse nonimplication	see \leftarrow and \nsubset
\convolution (*)	23
\Coppa (⌚)	87
\coppa (⌚)	87
\coprod (\coprod)	21, 25
\coprod (\coprod)	29
copyright	9, 19, 116
\copyright (©)	9
\corner (⊸)	18
corners, box	97
\corona (⟳)	95
\coronainv (⟳)	95
\Corresponds (\cong)	67
\corresponds (\cong)	32
\cos (cos)	49, 113
\cosh (cosh)	49
\cot (cot)	49
\coth (coth)	49
\counterplay (\approx)	93
Courier (font)	18
CP1252	see code page 1252
CP437	see code page 437
\cpa (‡)	86
\cpe (ſ)	86
\cpi (ℳ)	86
\cpo (ℳ)	86
\cpu (ℳ)	86
\CR (♪)	72
\cr	104
\cra (ℳ)	86
\cre (ℳ)	86
Creative Commons licenses .	19
crescent (fge package option) .	58
\cri (ℳ)	86
\cro (ℳ)	86
\Cross (ℳ)	79
\Cross († vs. † vs. ×)	101
\Cross (†)	76
\Cross (†)	90
cross ratio	see \textrecip
\crossb (ℳ)	13
\CrossBoldOutline (ℳ)	76
\CrossClowerTips (ℳ)	76
\crossd (ℳ)	13
\Crossedbox (ℳ)	90
crosses	76, 77, 90, 94
\crossh (ℳ)	13
\CrossMaltese (ℳ)	76
\crossnilambda (ℳ)	13
\CrossOpenShadow (ℳ)	76
\CrossOutline (ℳ)	76
crotchet	see musical symbols
\crtilde (ℳ)	16
\Cru (ℳ)	86
crucifixes	76, 77, 90
\Crux (ℳ)	57
\crux (ℳ)	57
\Csa (ℳ)	86
\csc (csc)	49
\Cse (ℳ)	86
\cshuffle (ℳ)	24
\Csi (ℳ)	86
\Cso (ℳ)	86
\Csu (ℳ)	86
\Cta (ℳ)	86
CTAN	see Comprehensive TeX Archive Network
\Cte (ℳ)	86
\Cti (ℳ)	86
\Cto (ℳ)	86
\Ctrl (ℳ)	72
\Ctu (ℳ)	86
\Cu (ℳ)	86
\Cube (ℳ)	92, 103
cube root	see \sqrt
\Cup (ℳ)	22
\Cup (ℳ)	24
\cup (ℳ)	23
\cup (ℳ)	22, 104, 112
\cup (ℳ)	24
\cupdot (ℳ)	24
\cupplus (ℳ)	24
\curlyc (ℳ)	13
\curlyeqprec (ℳ)	32
\curlyeqprec (ℳ)	30
\curlyeqprec (ℳ)	33
\curlyeqsucc (ℳ)	32
\curlyeqsucc (ℳ)	30
\curlyeqsucc (ℳ)	33
\curlyesh (ℳ)	13
\curlyvee (ℳ)	23
\curlyvee (ℳ)	22
\curlyvee (ℳ)	24
\curlyveedot (ℳ)	24
\curlyveedownarrow (ℳ)	22
\curlyveeuparrow (ℳ)	22
\curlywedge (ℳ)	23
\curlywedge (ℳ)	22
\curlywedge (ℳ)	24
\curlywedgedot (ℳ)	24
\curlywedgedownarrow (ℳ)	22
\curlywedgeuparrow (ℳ)	22
\curlyyyogh (ℳ)	13
\curlyyz (ℳ)	13
\currency (ℳ)	18
currency symbols	18, 19, 68
\curvearrowbotleft (ℳ)	42
\curvearrowbotleftright (ℳ)	42
\curvearrowbotright (ℳ)	42
\curvearrowdownup (ℳ)	43
\curvearrowleft (ℳ)	42
\curvearrowleft (ℳ)	41
\curvearrowleft (ℳ)	44
\curvearrowleftright (ℳ)	42
\curvearrowleftright (ℳ)	43
\curvearrownesw (ℳ)	43
\curvearrownwse (ℳ)	43
\curvearrowright (ℳ)	42
\curvearrowright (ℳ)	41
\curvearrowright (ℳ)	44
\curvearrowrightleft (ℳ)	43
\curvearrowsenw (ℳ)	43
\curvearrowswe (ℳ)	43
\curvearrowupdown (ℳ)	43
\Cutleft (ℳ)	75
\Cutline (ℳ)	75
cutoff subtraction	see \dotdiv
\Cutright (ℳ)	75
\Cwa (ℳ)	86
\Cwe (ℳ)	86
\Cwi (ℳ)	86
\Cwo (ℳ)	86
\Cxa (ℳ)	86
\Cxe (ℳ)	86
\Cya (ℳ)	86
\Cyo (ℳ)	86
\cyprfamily	86
Cypriot	86
cypriot (package)	86, 119, 121
\Cza (ℳ)	86
\Czo (ℳ)	86
D	
\D (ℳ)	17
d (esvect package option)	61
\d (ℳ)	14
\dag (ℳ)	9, 117
\dagger (ℳ)	22
\daleth (ℳ)	51
\daleth (ℳ)	51
\danger (ℳ)	91
dangerous bend symbols	89
\DArrow (ℳ)	72
\dasharrow	see \dashrightarrow
\dasheddownarrow (ℳ)	43

\ell (ℓ)	51
\Ellipse (○)	80
ellipses (dots)	9, 63–65, 107
ellipses (ovals)	80
\EllipseShadow (○)	80
\EllipseSolid (●)	80
\EM (↓)	72
\Email (✉)	73
\Emailct (✉)	73
\emgma (ŋ)	13
\emptyset (Ø)	65
\emptyset (∅)	66
\End ([End])	72
end of proof	65
\ending (⊥)	93
\eng (ŋ)	13
engineering symbols	70, 73
\engma (ŋ)	13
\ENQ (♣)	72
entails see \models	
\Enter ([Enter])	72
\Envelope (✉)	80
envelopes	80, 98
\enya (ɲ)	13
\EOT (♦)	72
\epsdice (package)	92, 119, 120
\epsdice (▣▣▣▣▣)	92
\epsi (ε)	13
\epsilon (ε)	50
\epsilononup (ε)	50
\eqbump (≈)	32
\eqbumped (≈)	32
\eqcirc (=)	32
\eqcirc (==)	30
\eqcirc (≈)	32
\Eqcolon (=:)	31
\Eqcolon (==:)	34
\Eqcolon (=:)	32
\Eqcolon (=:)	34
\Eqcolon (=:)	31
\eqdot (≈)	32
\eqfrown (≈)	48
\Eqqcolon (=:)	31
\Eqqcolon (==:)	34
\Eqqcolon (=:)	34
\Eqqcolon (=:)	31
\eqsim (≈)	31
\eqsim (≈)	32
\eqslantgtr (⪻)	38
\eqslantgtr (⪻)	38
\eqslantgtr (⪻)	39
\eqslantless (⪻)	38
\eqslantless (⪻)	38
\eqsmile (≈)	48
\equal (=)	32
\equal (=)	93
\equalclosed (⊐)	32
\qualscolon (=:)	36
\qualscoloncolon (==:)	36
\qualsfill	21, 108
equidecomposable	104
equilibrium see \rightleftharpoons	
\equiv (≡)	21, 30
\equiv (≡)	32
equivalence see \equiv, \leftrightsquigarrow, and \threesim	
\equivclosed (⊐)	32
\er (ø)	13
es-zet see \ss	
\ESC (←)	72
\Esc ([Esc])	72
escapable characters	9
\esh (ʃ)	13
\esh (ʃ)	13
esint (package)	28, 119
\Estatically (▲)	74
estimated see \textestimated	
\esvect (package)	61, 119
\eta (η)	50
\etaup (η)	50
\ETB (‡)	72
\eth (ð)	66
\eth (ð)	13
\eth (ð)	13
\ETX (♥)	72
eufrak (package)	68
Euler Roman	51
\EUR (€)	18
\EURcr (€)	18
\EURdig (€)	18
\EURhv (€)	18
\Euro (€)	19
\euro	19
euro signs	18, 19
blackboard bold	68
\eurologo (€)	19
\eurosym (package)	19, 119, 120
\EURtm (€)	18
\euscript (package)	68, 119, 120
evaluated at see \vert	
evil spirits	98
exclusive disjunction	
... see \nleftrightsquigarrow \nequiv, and \oplus	
exclusive or	103
\exists (Ǝ)	52
\exists (Ǝ)	51
\exists (Ǝ)	52
\exp (exp)	49
\Explosionsafe (⊗)	74
\extrarrows (package)	62, 119, 120
extensible accents	59–61, 63, 108–109
extensible arrows	59–63
extensible symbols, creating	107– 109
extensible tildes	59, 61
extension characters	48, 49
\extpfeil (package)	63, 119, 120
\extraipa (package)	16, 119
\eye (👁)	80
\EyesDollar (\$)	18
F	
f (esvect package option)	61
faces	72, 81, 88, 90, 91, 96, 98
\fallingdotseq (⊐)	32
\fallingdotseq (⊐)	30
\fallingdotseq (⊐)	32
\FallingEdge (⊸)	70
\fatbslash (\)	22
\fatsemi (§)	22
\fatslash (\)	22
\FAX (✉)	73
\fax (✉)	73
\Faxmachine (✉)	73
\fc (package)	10, 14
\fcdice (▣▣▣▣▣)	92
\fcfont (package)	119
\fcscore (I III III)	92
feet see \prime and \textquotesingle	
\FEMALE (♀)	74
\Female (♀)	74
female	12, 71, 73, 74
\female (♀)	73
\FemaleFemale (♀)	74
\FemaleMale (♂)	74
\Ferli (ⓘ)	89
\Fermi (ⓘ)	89
fermions	74
\feyn (package)	74, 119, 120
Feynman slashed character nota- tion	105
Feynman-diagram symbols	74
\feyn{a} (Ⓐ)	74
\feyn{c} (○)	74
\feyn{fd} (⤓)	74
\feyn{flS} (⤓)	74
\feyn{f1} (⤓)	74
\feyn{fs} (⤓)	74
\feyn{fu} (⤓)	74
\feyn{fv} (⠀)	74
\feyn{f} (⠀)	74
\feyn{g1} (⤓)	74
\feyn{gd} (⤓)	74
\feyn{glB} (⤓)	74
\feyn{glS} (⤓)	74
\feyn{glu} (⤓)	74
\feyn{gl} (⤓)	74
\feyn{gu} (⤓)	74
\feyn{gvs} (⤓)	74
\feyn{gv} (⤓)	74
\feyn{g} (⤓)	74
\feyn{hd} (⤓)	74
\feyn{hs} (⤓)	74
\feyn{hu} (⤓)	74
\feyn{h} (⤓)	74
\feyn{ms} (⤓)	74
\feyn{m} (⤓)	74
\feyn{P} (●)	74

\feyn{p} (⌚)	74
\feyn{x} (⌚)	74
\FF (⌚)	72
fge (package) .	47, 53, 58, 65, 67, 119, 120
fge-digits	65
\fgeA (⌚)	53
\fgebackslash (⌚)	67
\fgebaracute (⌚)	67
\fgebarcap (⌚)	67
\fgec (⌚)	53
\fgecap (⌚)	67
\fgecapbar (⌚)	67
\fgecup (⌚)	67
\fgecupacute (⌚)	67
\fgecupbar (⌚)	67
\fged (⌚)	53
\fgee (⌚)	53
\fgeesett (⌚)	53
\fgeeta (⌚)	53
\fgeF (⌚)	53
\fgef (⌚)	53
\fgeinfty (⌚)	67
\fgelangle (⌚)	67
\fgelb	53
\fgelb (⌚)	53
\fgeleftB (⌚)	53
\fgeleftC (⌚)	53
\fgeN (⌚)	53
\fgeoverU (⌚)	53
\fgerightarrow (⇒)	47
\fgerightB (⌚)	53
\fges (⌚)	53
\fgestruckone (⌚)	65
\fgestruckzero (⌚)	65
\fgeU (⌚)	53
\fgeuparrow (⌚)	47
\fgeuparrow (⌚)	67
\FHBOLOGO (⌚)	90
\FHBOLogo (⌚)	90
field (⌚) .	see alphabets, math
\file (⇒)	93
\FilledBigCircle (●)	79
\FilledBigDiamondshape (◆)	79
\FilledBigSquare (■)	79
\FilledBigTriangleDown (▼)	79
\FilledBigTriangleLeft (◀)	79
\FilledBigTriangleRight (▶)	79
\FilledBigTriangleUp (▲)	79
\FilledCircle (●)	79
\FilledCloud (⌚)	91
\filleddiamond (◆)	25
\FilledDiamondShadowA (◆)	79
\FilledDiamondShadowC (◆)	79
\FilledDiamondshape (◆)	79
\FilledHut (⌚)	91
\filledlargestar (★)	79
\filledlozenge (◆)	79
\filledmedlozenge (◆)	79
\filledmedsquare (■)	25
\filledmedtriangledown (▼)	25, 40
\filledmedtriangleleft (◀)	25, 40
\filledmedtriangleright (▶)	25, 40
\filledmedtriangleup (▲)	25, 40
\FilledRainCloud (⌚)	91
\FilledSectioningDiamond (❖)	92
\FilledSmallCircle (●)	79
\FilledSmallDiamondshape (◆)	79
\FilledSmallSquare (■)	79
\FilledSmallTriangleDown (▼)	79
\FilledSmallTriangleLeft (◀)	79
\FilledSmallTriangleRight (▶)	79
\FilledSmallTriangleUp (▲)	79
\FilledSnowCloud (⌚)	91
\FilledSquare (■)	79
\filledsquare (■)	25
\FilledSquareShadowA (■)	79
\FilledSquareShadowC (■)	79
\filledsquarewithdots (❖)	80
\filledstar (★)	25
\FilledSunCloud (⌚)	91
\FilledTriangleDown (▼)	79
\filledtriangledown (▼)	25, 40
\FilledTriangleLeft (◀)	79
\filledtriangleleft (◀)	25, 40
\FilledTriangleRight (▶)	79
\filledtriangleright (▶)	25, 40
\FilledTriangleUp (▲)	79
\filledtriangleup (▲)	25, 40
\FilledWeakRainCloud (⌚)	91
finger, pointing .	see fists
finite field (⌚) .	see alphabets, math
\finpartvoice (✉)	16
\finpartvoiceless (✉)	16
\fint (ƒ)	27
\fint (ƒ)	28
\Finv (⌚)	52
\Finv (⌚)	52
\Fire (⌚)	92
fish hook .	see \strictif
fists .	76
\fivedots (⋮)	23, 64
\FiveFlowerOpen (⌚)	78
\FiveFlowerPetal (⌚)	78
\FiveStar (★)	78
\FiveStarCenterOpen (★)	78
\FiveStarConvex (★)	78
\FiveStarLines (★)	78
\FiveStarOpen (★)	78
\FiveStarOpenCircled (⌚)	78
\FiveStarOpenDotted (★)	78
\FiveStarOutline (★)	78
\FiveStarOutlineHeavy (★)	78
\FiveStarShadow (★)	78
\Fixedbearing (⌚)	73
\fixedddots (⋮)	63
\fixedvdots (⋮)	63
fixmath (package) .	113
\fj (fj)	13
\Flag (⌚)	91
\flap (rf)	13
\flapr (rf)	13
\flat (b)	65, 88
\flat (b)	66
\Flatsteel (-)	73
fletched arrows .	47, 75
fleurons .	78, 80
florin .	see \textflorin
\floweroneleft (⌚)	78
\floweroneright (⌚)	78
flowers .	78
Flynn, Peter .	104
\Fog (⌚)	91
font encodings	
Latin 1 .	119
font encodings .	8, 114, 115
7-bit .	8
8-bit .	8
ASCII .	119
document .	115
limiting scope of .	8
LY1 .	8
OT1 8, 10, 14, 107, 114, 115	
OT2 .	103
T1 .	8, 10, 14, 115
T4 .	10, 14, 17
T5 .	10, 14
TS1 .	115
fontdef.dtx (file) .	103, 107
fontenc (package) .	8, 10, 14, 115
\fontencoding .	8
fonts	
Calligra .	68
Charter .	18, 30
Computer Modern .	100, 102, 115
Courier .	18
Garamond .	18, 30
Helvetica .	18
Symbol .	51, 103
Times Roman .	18, 102
Type 1 .	112
Utopia .	18, 30
Zapf Chancery .	68
Zapf Dingbats .	75, 77

\HandCuffRight (⌚)	76
\HandCuffRightUp (⌚)	76
\HandLeft (⌨)	76
\HandLeftUp (⌨)	76
\HandPencilLeft (✍)	76
\HandRight (⌨)	76
\HandRightUp (⌨)	76
hands	see fists
\Handwash (🚿)	90
\HaPa (-)	89
harmony (package)	89, 119, 120
harpoon (package)	47, 119, 121
harpoons	41, 43, 46, 47
\hash (#)	66
hash mark	see \#
\hat (🎩)	57
\hateq (=)	32
\hausaB (Ɓ)	13
\hausab (Ɓ)	13
\hausaD (Ɗ)	13
\hausad (Ɗ)	13
\hausaK (Ƙ)	13
\hausak (ƙ)	13
\HB (߂)	82
\Hb (߂)	82
\HBar (—)	79
\hbar (ℏ)	51, 52, 103
\hbipropto (∞)	23
\HC (܂)	82
\Hc (܂)	82
\hcrossing (♾)	33
\HCthousand (߁)	82
\HD (߁)	82
\Hd (߁)	82
\hddotdot (..)	23, 64
\hdots (...)	64
\Hdual (߁)	82
\HE (܂)	82
\He (܂)	82
heads	see faces
\Heart (♡)	90
hearts (suit)	65–67, 80
\heartsuit (♡)	65
\heartsuit (♡)	66
Hebrew	51, 68
Helvetica (font)	18
\hemibelion (c)	19
\HERMAPHRODITE (⚥)	74
\Hermaphrodite (⚥)	74
\hexagon (○)	78
\Hexasteel (܂)	73
\hexstar (*)	77
\HF (F)	70
\HF (܂)	82
\Hf (܂)	82
\hfermion (_)	74
\hfil	105
\HG (߁)	82
\Hg (߁)	82
\HH	89
\HH (܂)	82
\Hh (܂)	82
hhcount (package)	92, 119, 121
\Hundred (߁)	82
\HI (܂)	82
\Hi (܂)	82
\hiatus (܂)	95
\Hibl (܂)	82
\Hibp (܂)	82
\Hibs (܂)	82
\Hibw (܂)	82
hierogl (package)	82, 119, 120
hieroglyphics	82
Hilbert space (܂)	see alphabets, math
\hill (܂)	16
\HJ (܂)	82
\Hj (܂)	82
\HK (܂)	82
\Hk (܂)	82
\hksqrt (܂)	106
\HL (܂)	82
\Hl (܂)	82
\HM (܂)	82
\Hm (܂)	82
\Hman (܂)	82
\Hmillion (܂)	82
\Hms (܂)	82
\HN (܂)	82
\Hn (܂)	82
\HO (܂)	82
\Ho (܂)	82
Holt, Alexander	1, 118
\holter (܂)	63
holtpolt (package)	63, 119
\hom (hom)	49
\Home (܂)	72
	
\Homer (܂)	96
\Hone (܂)	82
hook accent (܂)	see accents
\hookb (܂)	13
\hookd (܂)	13
\hookd (܂)	13
\hookdownminus (܂)	66
\hookg (܂)	13
\hookh (܂)	13
\hookheng (܂)	13
\hookleftarrow (܂)	41
\hookleftarrow (܂)	44
\hookrevepsilon (܂)	13
\hookrightarrow (܂)	41
\hookrightarrow (܂)	44
\hookupminus (܂)	66
Horn, Berthold	69
\HP (܂)	82
\Hp (܂)	82
\Hplural (܂)	82
\Hplus (܂)	82
\HQ (܂)	82
\Hq (܂)	82
\Hquery (܂)	82
\HR (܂)	82
\Hr (܂)	82
\HS (܂)	82
\Hs (܂)	82
\Hscribe (܂)	82
\Hslash (܂)	82
\hslash (܂)	52
\Hsv (܂)	82
\HT (܂)	82
\HT (܂)	72
\Ht (܂)	82
\Hten (܂)	82
\Hthousand (܂)	82
\Htongue (܂)	82
\HU (܂)	82
\Hu (܂)	82
Hungarian umlaut (܂)	see accents
\Hut (܂)	91
\HV (܂)	82
\Hv (܂)	82
\hv (hv)	13
\Hvbar (܂)	82
\HW (܂)	82
\Hw (܂)	82
\HX (܂)	82
\Hx (܂)	82
\HXthousand (܂)	82
\HY (܂)	82
\Hy (܂)	82
hyphen, discretionary	115
\HZ (܂)	82
\Hz (܂)	82
I	
ି	14
\i (ି)	14
\ialign	104, 106, 108
\ibar (ି)	13
IBM PC	72, 97, 115
Icelandic staves	97
\IceMountain (܂)	91
\iddots (ିି)	64
\iddots ()	107
\idotsint (ିିି)	26
\idotsint (ିିି)	27
\idotsint (ିିି)	29
\iff . see \Longleftrightarrow	

\ifsym (package)	70, 79, 91, 92, 101, 103, 119, 120
\igo (package)	94, 119
\igocircle ()	94
\igocircle ()	94
\igocross ()	94
\igocross ()	94
\igonone ()	94
\igonone ()	94
\igosquare ()	94
\igosquare ()	94
\igotriangle ()	94
\igotriangle ()	94
\iiint ()	26
\iiint ()	27
\iiint ()	28
\iiint ()	29
\iiint ()	27
\iiint ()	26
\iiint ()	26, 27
\iiint ()	28
\iiint ()	29
\int ()	27
\int ()	26
\int ()	26, 28
\int ()	28
\int ()	29
\Im ()	51
\im (j)	52
\imath (i)	51, 57
\impliedby <i>see</i> \Longleftarrow	
\implies <i>see</i> \Longrightarrow and \vdash	
impulse train	<i>see</i> sha
\in (\in)	52
\in (\in)	51
\in (\in)	52
\in (\in)	52
inches	<i>see</i> \second and \textquotedbl
\incoh (\asymp)	36
independence	
probabilistic	106
statistical	106
stochastic	<i>see</i> \bot
\independent ($\perp\!\!\!\perp$)	106
\Industry ()	90
inequalities	9, 37–39
inexact differential	<i>see</i> \dbar
\inf (\inf)	49
infimum	<i>see</i> \inf and \sqcap
infinity (∞)	<i>see</i> \infty
\Info ()	98
\Info ()	90
information symbols	90
informator symbols	93
\infty (∞)	66
\infty (∞)	65
\infty (∞)	66
\inipartvoice ()	16
\inipartvoiceless ()	16
\injlim (injlim)	49
\inplus (\oplus)	31
\inputenc (package)	117
\Ins ()	72
\int (\int)	27
\int (\int)	25, 26
\int (\int)	26
\int (\int)	29
\intclockwise (\int)	30
\INTEGER (\mathbb{Z})	49
\Integer (\mathbb{Z})	49
integers (\mathbb{Z})	<i>see</i> alphabets, math
integrals	25–30, 66, 105–106
integrals (wasysym package op- tion)	26
\intercal (\intercal)	22
\intercal (\intercal)	52
\interleave (\parallel)	22
intersection	<i>see</i> \cap
\Interval ()	91
\inva (ν)	13
\invamp (\wp)	23
\invbackneg (\neg)	66
\INVd ()	73
\invdiameter (\wp)	88
\inve (\circ)	13
inverse limit	<i>see</i> \varprojlim
\InversTransformHoriz ($\bullet\circ$)	36
\InversTransformVert (\bullet)	36
inverted symbols	11–13, 17, 103
inverters	73
\invf (j)	13
\invglotstop (s)	13
\invh (q)	13
\INVl ()	73
\invlegr (l)	13
\invm (w)	13
\invneg (\neg)	31
\invneg (\neg)	66
\INVr ()	73
\invr (i)	13
\invscr (s)	13
\invscrita (v)	13
\INVu ()	73
\invv (Λ)	13
\invw (\mathfrak{m})	13
\invy (\mathfrak{x})	13
\iota (ι)	50
iota, upside-down	103
\iotaup (i)	50
\ipagamma (\wp)	13
\ipercatal (*)	95
\IroningI ()	90
\IroningII ()	90
\IroningIII ()	90
irony mark ($\grave{\iota}$)	103
irrational numbers (\mathbb{J})	<i>see</i> alphabets, math
\Irritant ()	92
\ismodeledby (\equiv)	103
ISO character entities	117
isoent (package)	117
J	
\j (j)	14
\JackStar ()	78
\JackStarBold ()	78
Jewish star	77, 78
\jmath (j)	51, 57
\Joch (j)	91
\Join (\bowtie)	30, 31
\Join (\bowtie)	24
\joinrel	103
joint denial	<i>see</i> \downarrowarrow
\unicode (package)	118
\unicode-Regular.ttf (file)	118
\Jupiter (\mathbb{J})	71
\Jupiter (\mathfrak{J})	71
\jupiter (\mathfrak{J})	71
K	
\k ()	17
\k ()	14
\kappa (κ)	50
\kappaup (κ)	50
\ker (ker)	49
ket	54
\Keyboard ()	72
keyboard symbols	72
keys, computer	72
keystroke (package)	72, 119, 120
\keystroke ()	72
king	94
knight	94
Knuth, Donald E.	8, 114, 122
symbols by	89
\Koppa (\mathfrak{Q})	87
\koppa (\mathfrak{l})	87
\Kr ()	89
\kreuz ($\mathfrak{*}$)	88
Kronecker product	<i>see</i> \otimes
Kronecker sum	<i>see</i> \oplus
\kroužek (\mathfrak{z})	<i>see</i> accents
\kside (\gg)	93
\Kutline (--)	75
L	
\L (L)	10
\l (l)	10
\labdentalnas (ŋ)	13
\labvel	16
\Ladiesroom (\mathfrak{L})	90
Lagrangian (\mathcal{L})	<i>see</i> alphabets, math
\Lambda (Λ)	50
\lambda (λ)	50
\lambdabdbar (λ)	66
\lambdabdaslash (λ)	66

\lambdaup (λ)	50	\lceil	55	\leftleftarrows (\Leftarrow)	44
Lamport, Leslie	118, 122	\lcirclearrowdown (\circlearrowleft)	43	\leftrightharpoons (\Leftleftarrows)	43
\land	see \wedge	\lcirclearrowleft (\circlearrowleft)	43	\leftsquigarrow (\sim)	44
\landdownint (\oint)	28	\lcirclearrowright (\circlearrowright)	43	\leftmapsto (\rightarrowtail)	44
\landdownint (\oint)	29	\lcirclearrowup (\circlearrowright)	43	\leftModels (\Rightarrow)	33
\landupint (\oint)	28	\lcircleleftint (\oint)	29	\leftmodels (\Rightarrow)	33
\landupint (\oint)	29	\lcirclerightint (\oint)	29	\leftmoon (\mathbb{C})	71
\langle	68	\lcm (lcm)	113	\leftmoon (\mathbb{C})	71
\angle ()	56	\lcorners (])	53	\leftp (^)	18
\angle ()	21, 54	\lcurvearrowdown (])	43	\leftpitchfork (\neg)	47
\angle ()	55	\lcurvearrowleft (\sim)	43	\leftpointright ($\mathbb{L}\mathbb{R}$)	76
\anglebar ()	55	\lcurvearrowne (>)	43	\leftproto (∞)	33
\Laplace (—○)	36	\lcurvearrownw (^)	43	\Leftrightarrow (\Leftrightarrow)	41
\laplace (○—●)	36	\lcurvearrowright (\sim)	43	\Leftrightarrow (\Leftrightarrow)	44
Laplace transform (\mathcal{L})	see alphabets, math	\lcurvearrowse (^)	43	\Leftrightarrow (\Leftrightarrow)	42
Laplacian (Δ)	see \Delta	\lcurvearrowsw (>)	43	\Leftrightarrow (\Leftrightarrow)	41
Laplacian (∇^2)	see \nabla	\lcurvearrowup (?)	43	\Leftrightarrow (\Leftrightarrow)	44
\largecircle (○)	79	\ldbrack ([])	55	\Leftrightarrow (\Leftrightarrow)	42
\largediamond (◇)	79	\ldotp (.)	63	\Leftrightarrow (\Leftrightarrow)	41
\largeiamond (◇)	79	\ldots (...)	63	\Leftrightarrow (\Leftrightarrow)	41
\largeiamond (◇)	79	\le	see \leq	\Leftrightarrow (\Leftrightarrow)	42
\largepentagon (☆)	79	\leadsto (\rightsquigarrow)	31, 41	\leftrightharpoon (→)	43
\large square (□)	79	\leadsto (\rightsquigarrow)	44	\leftrightharpoondown (→)	46
\largestar (☆)	79	leaf	see \textleaf	\leftrightharpoondownup (→)	
\largestarofdavid (◊)	79	\leafleft (←)	78	\leftrightharpoonup (→)	
\largeangledown (▽)	40	\leafNE (↗)	78	\leftrightharpoons (↔)	43
\largeangleleft (◀)	40	\leafright (→)	78	\leftrightharpoons (↔)	41
\largeangleright (▶)	40	leaves	78, 80	\leftrightharpoons (↔)	46
\largeangleup (△)	40	Lefschetz motive (\mathcal{L})	see alphabets, math	\leftrightharpoonsfill	62
\LArrow (➡)	72	\Left	96	\leftrightharpoonupdown (→)	
\arrowfill	62	\left	54, 56, 100, 102	\leftrightharpoonupdown (→)	
\laserbeam (※—)	74	\LEFTarrow (◀)	88	\leftrightharpoons (↔)	33
LaTeX	1, 8, 14, 26, 30, 49, 54, 63, 65, 73, 75, 100, 103–109, 112, 113, 115, 117–119, 121, 122	\Leftarrow (↔)	21, 41	\leftrightharpoons (↔)	33
LaTeX 2 ε	1, 8, 9, 19, 20, 22, 30, 36, 41, 58, 63, 65, 69, 73, 100, 101, 103, 106, 107, 111, 112, 114–117, 122	\Leftarrowtail (↔)	43	\leftrightsquigarrow (~~)	42
latexsym (package)	22, 30, 36, 41, 65, 100, 119	\Leftarrowtail (↔)	43	\leftrightsquigarrow (~~)	41
\latfric (⌚)	13	\Leftarrowtail (↔)	43	\leftrightsquigarrow (~~)	44
Latin 1	8, 115, 119	\leftfootline (→)	33	\leftrightsquigarrow (↔)	44
table	116	\leftfree (→)	33	\leftscissors (✂)	75
laundry symbols	90	\lefthalfcap (⌞)	23	\leftslice (⤒)	22
\Lbag (⦵)	53	\lefthalfcup (⌞)	24	\leftslice (⤒)	33
\lbag (⦵)	53	\lefthand (⤓)	76	\leftspoon (⤓)	47
\brace ({})	55	\leftharpoonccw (→)	46	\leftsquigarrow (~~)	42
\Lbrack ([])	68	\leftharpooncw (→)	46	\leftsquigarrow (~~)	42
\lBrack ([])	56	\leftharpoondown (→)	43	\leftturn (⤓)	88
LCD digits	70	\leftharpoondown (→)	41	\leftVdash (⊤)	33
\lCeil ([])	56	\leftharpoonup (→)	43	\leftvdash (⊣)	33
\lceil (]	54	\leftharpoonup (→)	41	\leftwave (⤓)	56
		\leftharpoonup (→)	41	\leftY (⤓)	24
		\leftharpoonup (→)	41	legal symbols	9, 19, 116
		\leftharpoonup (→)	41	\legm (✉)	13
		\leftharpoonup (→)	41	\legr (⠇)	13

\LinearACXXI (⌚)	83	\LinearALXXXV (↑)	84
\LinearACXXII (⌚)	83	\LinearALXXXVI (⌚)	84
\LinearACXXIII (⌚)	83	\LinearALXXXVII (⌚)	84
\LinearACXXIV (⌚)	83	\LinearALXXXVIII (⌚)	84
\LinearACXXIX (⌚)	83	\LinearALXXXX (⌚)	84
\LinearACXXV (⌚)	83	\LinearAV (⌚)	82
\LinearACXXVI (⌚)	83	\LinearAVI (⌚)	82
\LinearACXXVII (⌚)	83	\LinearAVII (+)	82
\LinearACXXVIII (⌚)	83	\LinearAVIII (⌚)	82
\LinearACXXIX (⌚)	83	\LinearAX (⌚)	82
\LinearACXXXI (⌚)	83	\LinearAXCI (⌚)	84
\LinearACXXXII (⌚)	83	\LinearAXCII (⌚)	84
\LinearACXXXIII (⌚)	83	\LinearAXCIII (⌚)	84
\LinearACXXXIV (⌚)	83	\LinearAXCIV (⌚)	84
\LinearACXXXIX (⌚)	83	\LinearAXCIX (⌚)	82
\LinearACXXXV (⌚)	83	\LinearAXCV (⌚)	84
\LinearACXXXVI (⌚)	83	\LinearAXCVI (⌚)	84
\LinearACXXXVII (⌚)	83	\LinearAXCVII (⌚)	84
\LinearACXXXVIII (⌚)	83	\LinearAXCVIII (⌚)	84
\LinearAI (⌚)	82	\LinearAXI (⌚)	82
\LinearAII (⌚)	82	\LinearAXII (⌚)	82
\LinearAIII (⌚)	82	\LinearAXIII (⌚)	82
\LinearAIV (⌚)	82	\LinearAXIV (⌚)	83
\LinearAIX (⌚)	82	\LinearAXIX (⌚)	83
\LinearAL (⌚)	83	\LinearAXL (⌚)	83
\LinearALI (⌚)	83	\LinearAXLI (⌚)	83
\LinearALII (⌚)	83	\LinearAXLII (⌚)	83
\LinearALIII (⌚)	83	\LinearAXLIII (⌚)	83
\LinearALIV (⌚)	83	\LinearAXLIV (⌚)	83
\LinearALIX (⌚)	83	\LinearAXLIX (⌚)	83
\LinearALV (⌚)	83	\LinearAXLV (⌚)	83
\LinearALVI (⌚)	83	\LinearAXLVI (⌚)	83
\LinearALVII (⌚)	83	\LinearAXLVII (⌚)	83
\LinearALVIII (⌚)	83	\LinearAXLVIII (⌚)	83
\LinearALX (⌚)	83	\LinearAXV (⌚)	83
\LinearALXI (⌚)	83	\LinearAXVI (⌚)	83
\LinearALXII (⌚)	83	\LinearAXVII (⌚)	83
\LinearALXIII (⌚)	83	\LinearAXVIII (⌚)	83
\LinearALXIV (⌚)	83	\LinearAXX (↑)	83
\LinearALXIX (⌚)	84	\LinearAXXI (⌚)	83
\LinearALXV (⌚)	83	\LinearAXXII (⌚)	83
\LinearALXVI (⌚)	84	\LinearAXXIII (⌚)	83
\LinearALXVII (⌚)	84	\LinearAXXIV (⌚)	83
\LinearALXVIII (⌚)	84	\LinearAXXIX (⌚)	83
\LinearALXX (⌚)	84	\LinearAXXV (⌚)	83
\LinearALXXI (⌚)	84	\LinearAXXVI (⌚)	83
\LinearALXXII (⌚)	84	\LinearAXXVII (⌚)	83
\LinearALXXIII (⌚)	84	\LinearAXXVIII (⌚)	83
\LinearALXXIV (⌚)	84	\LinearAXXX (⌚)	83
\LinearALXXIX (⌚)	84	\LinearAXXI (⌚)	83
\LinearALXXV (⌚)	84	\LinearAXXII (⌚)	83
\LinearALXXVI (⌚)	84	\LinearAXXIII (⌚)	83
\LinearALXXVII (⌚)	84	\LinearAXXIV (⌚)	83
\LinearALXXVIII (⌚)	84	\LinearAXXIX (⌚)	83
\LinearALXXX (⌚)	84	\LinearAXXXV (⌚)	83
\LinearALXXXI (⌚)	84	\LinearAXXXVI (⌚)	83
\LinearALXXXII (⌚)	84	\LinearAXXXVII (⌚)	83
\LinearALXXXIII (⌚)	84	\LinearAXXXVIII (⌚)	83
\LinearALXXXIV (⌚)	84	linearb (package)	85, 86, 119, 121
\LinearALXXXIX (⌚)	84	\Lineload (⌚)	73
		linguistic symbols	11–14
			96
		\lJoin (⋈)	31
		\ll (⟨)	38
		\ll (⟨)	37
		\ll (⟨)	39
		\llangle (⟨⟨)	55
		\llap	106
		\llbracket (⟨[)	54
		\llbracket (⟨[)	57
		\llceil (⟨⌈)	53
		\llcorner (⟨.)	53
		\llcorner (⟨_)	53
		\llcorner (⟨)	55
		\llcorner (⟨)	55
		\llcurly (⟨⟨)	32
		\Lleftarrow (⇐)	41
		\Lleftarrow (⇐)	44
		\llfloor (⟨⌊)	53
		\lll (⟨⟨)	38
		\lll (⟨⟨⟨)	38
		\lll (⟨⟨⟨ vs. ⟨⟨)	101
		\lll (⟨⟨⟨)	39
		\llless	see \lll
		\llless (⟨⟨⟨)	39
		\llparenthesis (⟨⟨)	53
		\lmoustache (⟨`)	54
		\lmoustache (⟨`)	54
		\ln (ln)	49
		\lnapprox (≈)	38
		\lnapprox (≈)	38
		\lnapprox (≈)	39
		\lneq (≠)	38
		\lneq (≠)	38
		\lneqq (≠)	38
		\lneqq (≠)	38
		\lneqq (≠)	38
		\lneqq (≠)	39
		\lnot	see \neg
		\lnot (¬)	66
		\lnsim (≈)	38
		\lnsim (≈)	38
		\lnsim (≈)	39
		local ring (𝓞)	see alphabets, math
		\log (log)	49, 113
		log-like symbols	49, 113
		logic gates	73
		logical operators	
		and	see \wedge
		not	see \neg and \sim
		or	see \vee
		\logof (⊗)	31
		lollipop	see \multimap
		long division	59
		\longa (—)	95
		\longcastling (O-O-O)	93
		longdiv (package)	59

\Longleftarrow (==)	41
\Longleftarrow (==)	43
\longleftarrow (==)	43
\longleftarrow (==)	41
\Longleftrightarrow (==>)	41
\Longleftrightarrow (==>)	43
\longleftrightarrow (==>)	43
\longleftrightarrow (==>)	41
\Longmapsfrom (==>)	42
\longmapsfrom (==>)	42
\Longmapsto (==>)	42
\longmapsto (==>)	43
\longmapsto (==>)	41
\LongPulseHigh (□□)	70
\LongPulseLow (□□)	70
\Longrightarrow (==>)	41
\Longrightarrow (==>)	43
\longrightarrow (==>)	43
\longrightarrow (==>)	41
\looparrowdownleft (↔)	42
\looparrowdownright (⤠)	42
\looparrowleft (↔)	42
\looparrowleft (↔)	41
\looparrowleft (↔)	43
\looparrowright (⤠)	42
\looparrowright (⤠)	41
\looparrowright (⤠)	43
\Loosebearing (△)	73
\lor	see \vee
\LowerDiamond (◆)	79
lowering	see \textlowering
\lozenge (◊)	65, 66
\lozenge (◊)	79
\Lparen (⟨)	68
\lrcorner (↗)	53
\lrcorner (↙)	53
\lrcorner (↙)	55
\lrcorner (↙)	55
\lrJoin	see \Join
\lrtimes (⊗)	31
\lsem (〔)	55
\lsemantic	see \ldbrack
\Lsh (↑)	42
\Lsh (↑)	41
\Lsh (↑)	43
\Lsteel (Ł)	73
\ltimes (⊗)	23
\ltimes (⊗)	22
\ltimes (⊗)	24
\ltriangle	57
Luecking, Dan	106
\lVert ()	54
\lVert ()	56
\lvert ()	54
\lvertneqq (⊉)	38
\lvertneqq (⊉)	38
\lvertneqq (⊉)	39
\lwave (⚡)	56
\lWavy (⚡)	55
\lwave (⚡)	55
\lwave (⚡)	55
\lwavy (⚡)	55
\lz (ȝ)	13
M	
\M	10
\M (‘)	95
\m	10
\m (‘)	95
\ma (ꝑ)	95
\macron (ꝑ)	17
macron (ꝑ)	see accents
\Maggie (ꝑ)	96
magical signs	97
majuscules	50
\makeatletter	107
\makeatother	107
\MALE (♂)	74
\Male (♂)	74
male	71, 73, 74
\male (♂)	73
\MaleMale (⚥)	74
\maltese (✠)	10
\maltese (✠)	66
man	81, 90
\manboldkidney (◎)	89
\manconcentriccircles (◎)	89
\manconcentricdiamond (◇)	89
\mancone (◇)	89
\mancube (▣)	89
\manerrarrow (⤠)	89
\manfilledquartercircle (◐)	89
manfnt (package)	89, 119, 120
\manhpennib (ˍ)	89
\manimpossiblecube (▣)	89
\mankidney (◎)	89
\manlhpennkidney (◎)	89
\manpenkidney (◎)	89
\manquadrifolium (❖)	89
\manquartercircle (⤠)	89
\manrotatedquadrifolium (❖)	89
\manstar (★)	89
\mantiltpennib (ˍ)	89
\mantriangledown (▼)	89
\mantriangleright (►)	89
\mantriangleup (▲)	89
\manvpennib (ˍ)	89
\Mappedfromchar (⌚)	48
\mappedfromchar (⌚)	48
\Mapsfrom (==>)	42
\mapsfrom (==>)	42
\Mapsfromchar (⌚)	49
\Mapsfromchar (⌚)	48
\mapsfromchar (⌚)	49
\mapsfromchar (⌚)	48
\Mapsto (⇒)	42
\mapsto (→)	41
\mapsto (→)	44
\Mapstochar ()	49
\Mapstochar (⌚)	48
\mapstochar ()	49
\Mars (♂)	71
\Mars (♂)	71
\mars (♂)	71
\MartinVogel (ℳ)	90
marvosym (package)	18, 65, 67, 71–75, 90, 101
masonic cipher	98
\mate (#)	93
material biconditional	see \leftrightarrow and \equiv
material conditional	see \rightarrow and \supset
material equivalence	see \leftrightarrow and \equiv
material implication	see \rightarrow and \supset
material nonimplication	see \nrightarrow and \nsupset
math alphabets	68
mathabx (package)	21, 23, 25, 26, 30, 32, 36–38, 40, 42, 43, 49, 52–55, 58, 60, 65, 66, 71, 93, 100, 101, 119, 120, 123
\mathaccent	104
\mathbb	68
\mathbbm	68
\mathbbmss	68
\mathbbmtt	68
mathbbol (package)	68
\mathbf	113
\mathbin	112
\mathbold	113
mathcal (euscript package option)	68
\mathcal	68
\mathcent (¢)	52
\mathchoice	105, 106
\mathclose	112
mathcomp (package)	65
mathdesign (package)	18, 24, 30, 52, 56, 67, 119
\mathdollar (\$)	21
mathdots (package)	58, 63, 64, 107, 119, 120
\mathds	68
\mathellipsis (...)	21
mathematical symbols	21–69
\mathfrak	68



\mathit	68
\mathnormal	68
\mathop	112
\mathopen	112
\mathord	112
\mathpalette	106
\mathparagraph (¶)	21
\mathpunct	112
\mathpzc	68
\mathrel	103, 112
\mathring (̄)	57, 58
\mathrm	68
mathrsfs (package)	68, 119
mathscr (eucscript package option)	68
\mathscr	68
\mathsection (§)	21
\mathsterling (£)	52
\mathsterling (£)	21
mathtools (package)	21, 34, 60, 62, 119, 120
\mathunderscore (-)	21
\max (max)	49
Maxwell-Stefan diffusion coefficient	see \DH
\maya	65
\Mb (ڦ)	95
\mb (ڻ)	95
\Mbb (ڦ)	95
\mBb (ڻ)	95
\mbB (ڻ)	95
\mbb (ڻ)	95
mbboard (package)	68, 119
\mbbx (ڻ)	95
\mbox	106
\measuredangle (⦿)	66
\measuredangle (⦿)	66
\measuredangle (⦿)	66
mechanical scaling	109, 112
\medbackslash (＼)	24
\medbullet (●)	23
\medcirc (○)	23
\medcircle (○)	24
\meddiamond (◇)	25
\medlozenge (◇)	79
\medslash (／)	24
\medsquare (□)	25
\medstar (☆)	25
\medstarofdavid (◊)	79
\medtriangledown (▽)	25, 40
\medtriangleleft (◀)	25, 40
\medtriangleright (▶)	25, 40
\medtriangleup (△)	25, 40
\medvert (⊥)	24
\medvertdot (⊥)	24
membership	see \in
\Mercury (☿)	71
\Mercury (☿)	71
\mercury (☿)	71
\merge (ℳ)	22
METAFONT	69, 109–112
METAFONTbook symbols	89
metre (package)	17, 57, 95, 119, 120
\metre	95
metrical symbols	95
\mho (℧)	65, 66
micro	see \textmu
\micro (μ)	70
Microsoft® Windows®	115
\mid ()	30, 56
\middle	54
\midtilde (~)	18
MIL-STD-806	73
millesimal sign	see \textperthousand
\min (min)	49, 113
minim	see musical symbols
minus	see \textminus
\minus (-)	24
\minuscolon (:-)	36
\minuscoloncolon (:-:)	36
\minusdot (·)	24
\minushookdown (¬)	66
\minushookup (¬)	66
\minuso (⊖)	22, 104
minutes, angular	see \prime
miscellaneous symbols	65–67, 80, 88–99
“Missing \$ inserted”	21
\Mmappedfromchar (ℳ)	48
\mmappedfromchar (ℳ)	48
\Mmapstochar (ℳ)	48
\mmapstochar (ℳ)	48
MnSymbol (package)	21, 23–25, 29, 32–34, 37, 39, 40, 43–48, 51, 52, 55, 58–60, 64, 66, 67, 79, 119, 120
\Mobilefone (-Mobile)	73
\mod	49
\models (=)	30, 103
\models (=)	33
moduli space	see alphabets, math
monetary symbols	18, 19, 68
monus	see \dotdiv
\moo (±)	22
\Moon (⌚)	71
\Moon (⌚)	71
\MoonPha	98
\morepawns (➢)	93
\moreroom (○)	93
\Mountain (▲)	91
mouse	see \ComputerMouse
\MoveDown (▼)	90
\overlay	107
\MoveUp (▲)	90
\mp (∓)	22
\mp (∓)	24
\mu (μ)	50
\multimap (→)	30, 31
\multimap (→)	47
\multimapboth (→)	31
\multimapbothvert (↑)	31
\multimapdot (→)	31
\multimapdotboth (→)	31
\multimapdotbothA (→)	31
\multimapdotbothAvert (↑)	31
\multimapdotbothB (→)	31
\multimapdotbothBvert (↑)	31
\multimapdotbothvert (↑)	31
\multimapdotinv (→)	31
\multimapinv (→)	31
multiple accents per character	107
multiplicative disjunction	see \bindnasrepma, \invamp, and \parr
\Mundus (ℳ)	90
Museum of Icelandic Sorcery and Witchcraft	98
musical symbols	20, 65, 66, 88, 89
musixtex (package)	89
\muup (μ)	50
\MVAT (@)	90
\MVEight (8)	65
\MVFive (5)	65
\MVFour (4)	65
\MVNine (9)	65
\MVOne (1)	65
\MVRrightarrow (→)	90
\MVSeven (7)	65
\MVSix (6)	65
\MVThree (3)	65
\MVTtwo (2)	65
\MVZero (0)	65
N	
\nabla (▽)	65
\nabla (▽)	66
\NAK (§)	72
NAND gates	73
\NANDd (○)	73
\NAND1 (○)	73
\NANDr (○)	73
\NANDu (○)	73
\napprox (≈)	32
\napprox (≈)	33
\napproxeq (≈)	31
\napproxeq (≈)	33
\nasym (≠)	31
\nasym (≠)	48
nath (package)	53, 56, 57, 119
\NATURAL (ℕ)	49
\Natural (ℕ)	49
\natural (♮)	65, 88
\natural (♮)	66
natural numbers (ℕ)	see alphabets, math

navigation symbols	90	\ndoublesmileeq (⌚)	48	\neqsmile (⌚)	48
\nbackapprox (⌚)	33	\nDownarrow (⤒)	45	\nequal (⌚)	33
\nbackapproxeq (⌚)	33	\ndownarrow (⤑)	45	\nequalclosed (⌚)	33
\nbackcong (⌚)	33	\ndownarrowtail (⤑)	45	\nequiv (⌚)	31
\nbackeqsim (⌚)	33	\ndowndownarrows (⤒)	45	\nequiv (⌚)	33
\nbacksimeq (⌚)	31	\ndownfilledspoon (⤑)	47	\nequivclosed (⌚)	33
\nbacksim (⌚)	33	\ndownfootline (⤑)	34	\nersquigarrow (⤓)	43
\nbacksimeq (⌚)	31	\ndownfree (⤑)	34	\nespoon (⤔)	47
\nbacksimeq (⌚)	34	\ndownharpoonccw (⤑)	46	\Neswarrow (⤔)	43
\nbacktriplesim (⌚)	34	\ndownharpooncw (⤑)	46	\neswarrow (⤔)	106, 107
\NBSP (⌚)	72	\ndownlsquigarrow (⌚)	45	\neswarrow (⤑)	43
\nBumpeq (⌚)	31	\ndownmapsto (⤑)	45	\neswarrows (⤔)	43
\nBumpeq (⌚)	34	\ndownModels (⤔)	34	\neswbipropto (⤔)	24
\nbumpseq (⌚)	31	\ndownmodels (⤔)	34	\neswcrossing (⌚)	33
\nbumpseq (⌚)	34	\ndownpitchfork (⤔)	47	\neswharpoonnwse (⤔)	46
\ncirceq (⌚)	34	\ndownrsquigarrow (⌚)	45	\neswharpoons (⤔)	46
\ncleararrowleft (⌚)	46	\ndownspoon (⤑)	47	\neswharpoonsenw (⤔)	46
\ncleararrowright (⌚)	46	\ndownuparrows (⤒)	45	\Neswline (⤔)	33
\closedequal (⌚)	34	\ndownupharpoons (⤒)	46	\neswline (⤔)	33
\ncong (⌚)	32	\downVdash (⤔)	34	\Neutral (⦿)	74
\ncong (⌚)	31	\downvdash (⤔)	34	\neVdash (⤔)	33
\ncong (⌚)	34	\dststile (⤔)	35	\nevDash (⤔)	33
\ncurlyeqprec (⌚)	32	\dststile (⤔)	35	\newarrow	63
\ncurlyeqprec (⌚)	34	\dttstile (⤔)	35	\newmetrics	95
\ncurlyeqsucc (⌚)	32	\dttstile (⤔)	35	\newmoon (●)	71
\ncurlyeqsucc (⌚)	34	\ne	see \neq	\newmoon (●)	71
\curvearrowdownup (⌚)	44	\ne (⌚)	34	\newtie (⤔)	14
\curvearrowleft (⌚)	46	\nearrow (⤔)	42	\nexists (⌚)	52
\curvearrowleftright (⌚)	44	\nearrow (⤔)	43	\nexists (⌚)	52
\curvearrownewsw (⌚)	44	\nearrow (⤔)	42	\nexists (⌚)	52
\curvearrownwse (⌚)	44	\nearrow (⤔)	41, 106, 107	\nfallingdotseq (⌚)	33
\curvearrowright (⌚)	46	\nearrow (⤔)	43	\frown (⌚)	48
\curvearrowrightleft (⌚)	44	\nearrowtail (⤔)	43	\frown (⌚)	48
\curvearrowsenw (⌚)	44	\nefilledspoon (⤔)	47	\frownsmile (⌚)	48
\curvearrowswne (⌚)	44	\nefootline (⤔)	33	\frownsmileeq (⌚)	48
\curvearrowupdown (⌚)	44	\nefree (⤔)	33	\NG (⦿)	10
\dasharrow (⤔)	46	\neg (⌐)	65	\ng (ȝ)	10
\dasheddownarrow (⤔)	45	\neg (⌐)	66	\ngeq (⌚)	38
\dashedleftarrow (⤔)	45	negation	see \neg and \sim	\ngeq (⌚)	38
\dashednearrow (⤔)	45	\neharpoonccw (⤔)	46	\ngeq (⌚)	38
\dashednarrow (⤔)	45	\neharpooncw (⤔)	46	\ngeq (⌚)	39
\dashedrightarrow (⤔)	45	\nelsquigarrow (⤔)	43	\ngeqclosed (⌚)	39, 40
\dashedsearrow (⤔)	45	\nemapsto (⤔)	43	\ngeqdot (⌚)	39
\dashedswarrow (⤔)	45	\neModels (⤔)	33	\ngeqq (⌚)	38
\dasheduparrow (⤔)	45	\nemodels (⤔)	33	\ngeqq (⌚)	38
\dashleftarrow (⤔)	46	\nenearrows (⤔)	43	\ngeqq (⌚)	39
\dashrightarrow (⤔)	46	\nepitchfork (⌚)	47	\ngeqlant (⌚)	38
\DashV (⤔)	32	\Neptune (Ψ)	71	\ngeqlant (⌚)	39
\Dashv (⤔)	32	\Neptune (Ψ)	71	\ngeqlantdot (⌚)	39
\dashV (⤔)	32	\neptune (ȝ)	71	\ngets (⤔)	46
\dashv (⤔)	32	\neq (⌚)	32	\ngg (⤔)	38
\dashv (⤔)	34	\neq (⌚)	37	\ngg (⤔)	39
\dashVv (⤔)	32	\neq (⌚)	34	\nggg (⤔)	39
\ndashVv (⤔)	35	\neqbump (⌚)	34	\ngtr (⤔)	38
\ndiagdown (⤔)	34	\neqcirc (⌚)	34	\ngtr (⤔)	38
\diagup (⤔)	34	\neqdot (⌚)	34	\ngtr (⤔)	39
\divides (⤔)	34	\neqfrown (⌚)	48	\ngtrapprox (⤔)	38
\Doteq (⌚)	34	\neqsim (⌚)	33	\ngtrapprox (⤔)	38
\doteq (⌚)	34	\neqlantgtr (⌚)	38	\ngtrclosed (⤔)	39, 40
\doublefrown (⤔)	48	\neqlantgtr (⌚)	39	\ngtrdot (⌚)	39
\doublefrown (⌚)	48	\neqlantless (⌚)	38	\ngtreqless (⤔)	39
\doublesmile (⌚)	48	\neqlantless (⌚)	39		

\ngtreqlesslant (⌚)	39	\nleftmapsto (leftrightarrow)	45	\nmapsto (leftrightarrow)	46
\ngtreqqless (⌚)	39	\nleftModels (not\models)	34	\nmid (mid)	31
\ngtrless (⌚)	38	\nleftmodels (models)	34	\nmid (mid)	34
\ngtrless (⌚)	39	\nleftpitchfork (not\models)	47	\nmmodels (models)	34
\ngtrsim (⌚)	38	\nLeftrightarrow (leftrightarrow)	42	\nmultimap (multimap)	47
\ngtrsim (⌚)	38	\nLeftrightarrow (leftrightarrow)	41	\nnbststile ()	35
\nhateq (≠)	34	\nLeftrightarrow (leftrightarrow)	45	\nNearrow (nearrow)	44
\nhookleftarrow (leftrightarrow)	46	\nLeftrightarrow (leftrightarrow)	42	\nnearrow (nearrow)	42
\nhookrightarrow (leftrightarrow)	46	\nLeftrightarrow (leftrightarrow)	21, 41	\nnearrow (nearrow)	44
\ni (⌚)	51, 105	\nLeftrightarrow (leftrightarrow)	45	\nnarrowtail (arrowtail)	45
\ni (⌚)	52	\nLeftrightarrows (leftrightarrow)	45	\nfilledspoon (filledspoon)	47
\nialpha (α)	13	\nLeftrightharpoonup (leftrightarrow)	46	\nfootline (footline)	34
\nibar	see \ownsbar	\nLeftrightharpoons (leftrightarrow)	46	\nfree (free)	34
\nibeta (β)	13	\nLeftrightharpoonupdown (leftrightarrow)	46	\nharpoonccw (harpoonccw)	46
\nibLeft (⌚)	76	\nLeftrightline (not\models)	34	\nharpooncw (harpooncw)	46
\nibRight (⌚)	76	\nLeftrightline (+)	34	\nlsquigarrow (lsquigarrow)	45
nibs	76	\nLeftrightsquigarrow (leftrightarrow)	46	\nnemapsto (mapsto)	45
\nibSolidLeft (⌚)	76	\nLeftrsquigarrow (leftrightarrow)	45	\nneModels (neModels)	34
\nibSolidRight (⌚)	76	\nleftspoon (leftrightarrow)	47	\nnemodels (emodels)	34
nicefrac (package)	67, 119, 121	\nleftVdash (Vdash)	34	\nnenarrows (enarrows)	45
\nichi (⌚)	13	\nleftvdash (vdash)	34	\nnepitchfork (epitchfork)	47
\niepsilon (ε)	13	\nleq (≤)	38	\nnersquigarrow (rsquigarrow)	45
\nigamma (γ)	13	\nleq (≤)	38	\nnespoon (espoon)	47
\niota (ι)	13	\nleq (≤)	39	\nneswarrow (neswarrow)	45
\nilambda (λ)	13	\nleqclosed (closed)	39, 40	\nneswarrows (neswarrows)	45
\nin (⌚)	52	\nleqdot (≤)	39	\nneswharpoonnwse (neswharpoonnwse)	46
\niomega (ω)	13	\nleqq (≤)	38	\nneswharpoons (neswharpoons)	46
\niphil (φ)	13	\nleqlant (lant)	38	\nneswharpoonsew (neswharpoonsew)	46
\niplus (⊕)	31	\nleqlant (lant)	39	\nnesline (esline)	34
\nisigma (σ)	13	\nleqlantdot (lantdot)	39	\nnesline (esline)	34
\nitheta (θ)	13	\nless (less)	38	\nnevDash (evDash)	34
\niupsilon (υ)	13	\nless (less)	38	\nnevDash (evDash)	34
\niv (⟲)	53	\nless (less)	39	\nnbststile ()	35
\nj (jn)	13	\nlessapprox (lessapprox)	38	\nnbststile ()	35
\nlcirclearrowdown (⌚)	45	\nlessapprox (lessapprox)	38	\nnbststile ()	35
\nlcirclearrowleft (⌚)	45	\nlessclosed (closed)	39, 40	\nnwarrow (nwarrow)	45
\nlcirclearrowright (⌚)	45	\nlessdot (lessdot)	39	\nnwarrow (nwarrow)	42
\nlcirclearrowup (⌚)	45	\nlesseqgtr (lesseqgtr)	39	\nnwarrow (nwarrow)	45
\nlcurvearrowdown (⌚)	45	\nlesseqgtrslant (lesseqgtrslant)	39	\nnarrowtail (arrowtail)	45
\nlcurvearrowleft (⌚)	45	\nlesseqgqtr (lesseqgqtr)	39	\nnfilledspoon (filledspoon)	47
\nlcurvearrowright (⌚)	45	\nlessgtr (lessgtr)	38	\nnfootline (footline)	34
\nlcurvearrowone (⌚)	45	\nlessgtr (lessgtr)	39	\nnfree (free)	34
\nlcurvearrownw (⌚)	45	\nlesssim (lesssim)	38	\nharpoonccw (harpoonccw)	46
\nlcurvearrowright (⌚)	45	\nlesssim (lesssim)	38	\nharpooncw (harpooncw)	46
\nlcurvearrowse (⌚)	45	\nlhookdownarrow (lhookdownarrow)	45	\nlsquigarrow (lsquigarrow)	45
\nlcurvearrowsw (⌚)	45	\nlhookleftarrow (lhookleftarrow)	45	\nnmapsto (mapsto)	45
\nlcurvearrowup (⌚)	45	\nlhooknearrow (lhooknearrow)	45	\nnwModels (nwModels)	33
\nleadsto (⇒)	46	\nlhooknwarrow (lhooknwarrow)	44	\nnwmodels (nwmodels)	34
\nLeftarrow (↔)	42	\nlhookrightarrow (lhookrightarrow)	44	\nnwnwarrows (wnwarrows)	45
\nLeftarrow (↔)	41	\nlhooksearrow (lhooksearrow)	44	\nwpitchfork (wpitchfork)	47
\nLeftarrow (↔)	45	\nlhookswarrow (lhookswarrow)	44	\nnwsquigarrow (wsquigarrow)	45
\nleftarrow (↔)	42	\nlhookuparrow (lhookuparrow)	44	\nwsarrow (wsarrow)	45
\nleftarrow (↔)	41	\nll (ll)	38	\nwsarrow (wsarrow)	45
\nleftarrow (↔)	45	\nll (ll)	39	\nwsarrow (wsarrow)	45
\nleftarrowtail (↔)	45	\nLeftarrow (leftrightarrow)	44	\nwsarrow (wsarrow)	46
\nleftfilledspoon (↔)	47	\nLeftarrow (leftrightarrow)	44	\nwsarrow (wsarrow)	46
\nleftfootline (↔)	34	\nLeftarrow (leftrightarrow)	44	\nwsarrow (wsarrow)	46
\nleftfree (↔)	34	\nLeftarrow (leftrightarrow)	44	\nwsarrow (wsarrow)	46
\nleftharpoonccw (↔)	46	\nLeftarrow (leftrightarrow)	39	\nwsarrow (wsarrow)	46
\nleftharpooncw (↔)	46	\nLeftarrow (leftrightarrow)	39	\nwsarrow (wsarrow)	46
\nleftleftarrows (↔)	45	\nLeftarrow (leftrightarrow)	39	\nwsarrow (wsarrow)	46
\nleftlsquigarrow (↔)	45	\nlll (lll)	39	\nwsarrow (wsarrow)	46

\newrsquigarrow (✉) 43
\Nwsearrow (↖) 43
\nwsearrow (↖) 106
\nwsearrow (↖) 43
\nwsearrows (↖↖) 43
\nwsebiproto (ߒ) 24
\nwsecrossing (+) 32
\nwseharpoonnesw (↖) 46
\nwseharpoons (↖) 46
\nwseharpoonswne (↖) 46
\Nseline (⤒) 32
\Nseline (⤓) 32
\newspoon (՞) 47
\newVdash (՞) 32
\newVdash (՞) 32

O

\O (Ø) 10
\o (ø) 10
\o (o) 50
\oast (⊛) 25
\oasterisk (⊛) 25
\obackslash (⊘) 25
\obackslash (⊘) 25
\obar (◑) 22
\Obelus (————) 95
\obelus (————) 95
\Obelus* (÷) 95
\obelus* (÷) 95
\oblong (□) 22
\obot (⊕) 25
\obslash (⊘) 22
\oc () 21
\ocirc (◎) 25
\ocirc (◎) 25
\ocircle (○) 23
\ocoasterisk (⊛) 25
\octagon (○) 78
octonions (𝕆) ... see alphabets,
math

\Octosteel (●) 73

\od (▣) 16

\odiv (⊕) 25

\odot (⊙) 25

\odot (⊙) 22

\odot (⊙) 25

\odotplus (⊕) 24

\OE (Œ) 10, 117

\oe (œ) 10, 117

\officialeuro (€) 19

\offinterlineskip 104

ogonek (package) ... 17, 119, 121

ogonek (܂) ... see accents

\greaterthan (⊗) 22

\ohill (܂) 16

ohm see \textohm

\ohm (Ω) 70

\Ohne (܂) 89

\OHORN (܂) 10

\ohorn (܂) 10

\oiint (fff) 28

\oiint (fff) 30

\oiintclockwise (fff) 28
\oiintctrcclockwise (fff) 28
\oint (ff) 27
\oint (ff) 26, 28
\oint (ff) 28
\oint (ff) 30
\oint (ff) 29
\ointclockwise (ff) 28
\ointctrcclockwise (ff) 28
\oint (f) 27
\oint (f) 25
\oint (f) 29
\ointclockwise (f) 27
\ointclockwise (f) 28
\ointclockwise (f) 30
\ointctrcclockwise (f) 27
\ointctrcclockwise (f) 28
\ointctrcclockwise (f) 30
old-style digits 20
\oldstylenums 20
\oleft (⊕) 25
\olessthan (⊗) 22
\Omega (Ω) 50
\omega (ω) 50
\omegaaup (ω) 50
\ominus (⊖) 25
\ominus (⊖) 22
\ominus (⊖) 25
\onlymove (□) 93
\oo (oo) 95
\oo (oo) 13
\oalign 104, 105
\open („) 18
open unit disk (𝔻) see
alphabets, math

\openJoin (×) 31

\openo (○) 13

\openo (○) 13

\openo (○) 13

\opentimes (×) 31

operators

- binary 22–25
- logical ... see logical operators
- set see set operators
- unary 21

\oplus (⊕) 25

\oplus (⊕) 21, 22, 103

\oplus (⊕) 25

\opposbishops (▣) 93

\opposition (○) 71

optical scaling 109

options ... see package options

or see \vee

OR gates 73

\OrnamentDiamondSolid (❖) 80
ornaments 78, 80

\ORr (܂) 73

orthogonal to ... see \bot

\ORu (܂) 73

\oslash (⊘) 25

\oslash (⊘) 22

\oslash (⊘) 25

\ostar (⊛) 25

\otimes (⊗) 25

\otimes (⊗) 22

\otimes (⊗) 25

\otop (⊕) 25

\triangle (◎) 25, 40

\triangleup (◎) 25

ovals 80

\ovee (܂) 22

\overarc (܂) 17

\overbrace (܂) 60

\overbrace (܂) 60

\overbrace (܂) 60

\overbrace (܂) 59

\overbracket (܂) 60

\overbracket (܂) 108, 109

\overbridge (܂) 16

\overgroup (܂) 60

\overgroup (܂) 60

\overleftarrow (܂) 59

\overleftharp (܂) 47

\overleftharpdown (܂) 47

\overleftharpoon (܂) 60

\overleftrightarrow (܂) 59

\overline (܂) 21, 59

\overlinesegment (܂) 60

\overparenthesis (܂) 108, 109

\overrightarrow (܂) 59

overrightarrow (package) 59, 119

\overrightarrow (܂) 59

\overrightharp (܂) 47

\overrightharpdown (܂) 47

\overrightharpoon (܂) 60

\overring (°) 18

\overset 104

\overt (◑) 25

\void (○) 25

\owedge (○) 22

\owns see \ni

\owns (܂) 52

\owns (܂) 52

\owns (܂) 52

\ownsbar (܂) 52

P

\p (܂) 9, 116
\p () 95
\p@ 107

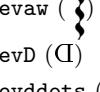
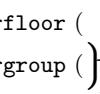
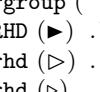
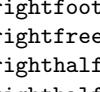
package options	
a (esvect)	61
b (esvect)	61
bbgreekl (mathbbol)	68
c (esvect)	61
crescent (fge)	58
d (esvect)	61
e (esvect)	61
f (esvect)	61
g (esvect)	61
german (keystroke)	72
greek (babel)	50, 87
h (esvect)	61
integrals (wasysym)	26
mathcal (euscript)	68
mathscr (euscript)	68
nointegrals (wasysym)	26
polutonikogreek (babel)	50
sans (dsfont)	68
utf8x (inputenc)	117
varg (txfonts/pxfonts)	51
packages	
longdiv	59
accents	58, 107, 119, 121
amsbsy	113
amsfonts	22, 30, 36, 41, 65, 68
amsmath	8, 49, 58, 104, 112
amssymb	8, 22, 30, 36, 41, 58, 65, 68, 87, 119, 120, 123
amstext	105, 106
ar	70, 119
arcs	17, 119, 120
arev	67, 88, 119, 120
ascii	72, 115, 119, 120
babel	50, 87
bbbing	75–78, 80, 101, 119, 120
bbm	68, 119
bbold	68, 119
bm	113, 119, 121
braket	54
calligra	68, 119, 121
calrsfs	68
cancel	59
cclicenses	19, 119, 120
centernot	105
chancery	119
chemarr	62, 119, 120
chemarrow	47, 62, 119
china2e	19, 49, 68, 98, 119, 121
clock	92, 119, 120
cmll	21, 24, 30, 36, 119
colonequals	21, 36, 119, 120
combelow	17, 119, 121
cypriot	86, 119, 121
dblaccnt	107
dictsym	96, 119, 120
dingbat	76, 80, 101, 119, 120
DotArrow	63, 119, 121
dozenal	65, 119
dsfont	68, 119
epsdice	92, 119, 120
esint	28, 119
esvect	61, 119
eufrak	68
eurosym	19, 119, 120
euscript	68, 119, 120
extarrows	62, 119, 120
extpfeil	63, 119, 120
extraipa	16, 119
fc	10, 14
fcffont	119
feyn	74, 119, 120
fge	47, 53, 58, 65, 67, 119, 120
fixmath	113
fontenc	8, 10, 14, 115
fontspec	118
fourier	19, 36, 51, 53, 57, 60, 76, 78, 91, 119
gensymb	70
graphics	47, 103
graphicx	17, 100, 103
harmony	89, 119, 120
harpoon	47, 119, 121
hhcount	92, 119, 121
hieroglif	82, 119, 120
holtpolt	63, 119
ifsym	70, 79, 91, 92, 101, 103, 119, 120
igo	94, 119
inputenc	117
isoent	117
junicode	118
keystroke	72, 119, 120
latexsym	22, 30, 36, 41, 65, 100, 119
linearA	82, 119, 121
linearb	85, 86, 119, 121
manfnt	89, 119, 120
marvosym	18, 65, 67, 71–75, 90, 101
mathabx	21, 23, 25, 26, 30, 32, 36–38, 40, 42, 43, 49, 52–55, 58, 60, 65, 66, 71, 93, 100, 101, 119, 120, 123
mathbbol	68
mathcomp	65
mathdesign	18, 24, 30, 52, 56, 67, 119
mathdots	58, 63, 64, 107, 119, 120
mathrsfs	68, 119
mathtools	21, 34, 60, 62, 119, 120
mbboard	68, 119
metre	17, 57, 95, 119, 120
milstd	73, 119
MnSymbol	21, 23–25, 29, 32–34, 37, 39, 40, 43–48, 51, 52, 55, 58–60, 64, 66, 67, 79, 119, 120
musixtex	89
nath	53, 56, 57, 119
nicefrac	67, 119, 121
ntheorem	65
ogonek	17, 119, 121
overrightarrow	59, 119
phaistos	81, 119, 120
phonetic	13, 16, 103, 119
pict2e	70
pifont	10, 75–78, 80, 103, 119, 120
pigpen	98, 119, 120
pmboxdraw	97, 119, 120
polynom	59
protosem	81, 119, 120
psnfss	77
pxfonts	21–23, 27, 30, 31, 36–38, 41, 42, 48, 50–52, 65, 66, 68, 100, 115
recycle	99, 119
rotating	19, 72
sarabian	87, 119, 121
savesym	100
semtrans	14, 17, 119, 120
shuffle	24, 119, 120
simplewick	109
simpsons	96, 119
skak	93, 94, 119, 120
skull	93, 119, 120
slashed	105
staves	97, 119
steinmetz	70, 119, 121
stmaryrd	22, 26, 31, 37, 40, 42, 48, 53, 54, 101, 104, 118–120
t4phonet	14, 17, 119, 120
teubner	19, 64, 87, 95, 119, 120
textcomp	8, 9, 14, 18–20, 41, 57, 67, 70, 88, 100, 115, 119
timing	70
tipa	11, 12, 14–17, 103, 119, 120
tipx	12, 119, 120
trfsigns	36, 52, 63, 119
trsym	36, 119, 120
turnstile	35, 119, 120
txfonts	21–23, 27, 30, 31, 36–38, 41, 42, 48, 50–52, 65, 66, 80, 100, 102, 115, 119, 120
type1cm	100
ucs	117, 118
ulsy	24, 48, 103, 119
underscore	9
undertilde	61, 119, 120
units	67
universa	80, 90, 119, 120
universal	75, 77, 80, 90, 119, 120
vietnam	119

\vntex	10, 14
\wasysym	13, 18, 20, 22, 23, 26, 30, 31, 36–38, 41, 64–66, 70, 71, 73, 77, 78, 88, 101, 119, 120
\wsuipa	13, 16, 18, 101, 103, 107, 119, 120
\xfrac	67
\yfonts	68, 69, 119, 120
\ymath	58, 59, 61, 64, 107, 119
Pakin, Scott	1, 108, 118
\PaperLandscape	92
\PaperPortrait	92
par	<i>see</i> \bindnasrepma, \invamp, and \parr
paragraph mark	<i>see</i> \P
\parallel ()	30, 56
\parallel (//)	33
\ParallelPort	72
\parallelslant (//)	36
\parr (ȝ)	24
\partial (ð)	52
\partial (ð)	51
\partial (ð)	53
\partialslash (ð)	52
\partialvardint (‘‘)	67
\partialvardlanddownint (߂)	67
\partialvardlandupint (߁)	67
\partialvardlcircleleftint (○)	43
\partialvardlcircleleftint (○)	67
\partialvardlcirclerightint (○)	43
\partialvardlcirclerightint (○)	67
\partialvardoint (○)	67
\partialvardoint (○)	67
\partialvardrcircleleftint (○)	43
\partialvardrcircleleftint (○)	67
\partialvardrcirclerightint (○)	43
\partialvardrcirclerightint (○)	67
\partialvardstrokedint (߁)	67
\partialvardsumint (߂)	67
\partialvartint (‘‘)	67
\partialvartlanddownint (߂)	67
\partialvartlandupint (߁)	67
\partialvartlcircleleftint (○)	43
\partialvartlcircleleftint (○)	67
\partialvartlcirclerightint (○)	43
\partialvartlcirclerightint (○)	67
\partialvartooint (○)	67
\partialvartooint (○)	67
\partialvartooint (○)	67
\partialvartrcIRCLELEFTINT (○)	43
\partialvartrcIRCLELEFTINT (○)	67
\partialvartrCIRCLERIGHTINT (○)	44
\partialvartrCIRCLERIGHTINT (○)	67
\partialvarTStrokEdint (߁)	67
\partialvarTsumint (߂)	67
particle-physics symbols	74
parts per thousand	<i>see</i> \textperthousand
\partvoice	16
\partvoiceless	16
\passedpawn	93
pawn	94
\pdfLATEX	118
\Peace	80
\PencilLeft	76
\PencilLeftDown	76
\PencilLeftUp	76
\PencilRight	76
\PencilRightDown	76
\PencilRightUp	76
pencils	76
\pentagon	78
\pentagram	25
\pentam (—○—○— —○—○—)	95
people	<i>see</i> faces
percent sign	<i>see</i> \%
\permil	20
\Perp (⊥)	31
\perp (⊥)	30, 106
\perp (⊥)	33
\perthousand	70
\Pfund (߂)	18
\PgDown (Page 1)	72
\PgUp (Page 1)	72
phaistos (package)	81, 119, 120
Phaistos disk	81
pharmaceutical prescription	<i>see</i> \textrecipe
\PHarrow	81
\phase	70
phasor	70
\PHbee	81
\PHbeehive	81
\PHboomerang	81
\PHbow	81
\PHbullLeg	81
\PHcaptive	81
\PHcarpentryPlane	81
\PHcat	81
\PHchild	81
\PHclub	81
\PHcolumn	81
\PHcomb	81
\PHdodium	81
\PHdove	81
\PHeagle	81
\PHflute	81
\PHgaunlet	81
\PHgrater	81
\PHhelmet	81
\PHhide	81
\PHhorn	81
\Phi	50
\phi	50
\phiiup	50
\PHlid	81
\PHlily	81
\PHmanacles	81
\PHmattock	81
\Phone	80
\phone	88
\PhoneHandset	80
phonetic (package)	13, 16, 103, 119
phonetic symbols	11–14
\photon (~~~~)	70
photons	74
\PHoxBack	81
\PHpapyrus	81
\PHpedestrian	81
\PHplaneTree	81
\PHplumedHead	81
\PHram	81
\PHrosette	81
\PHsaw	81
\PHshield	81
\PHship	81
\PHsling	81
\PHsmallAxe	81
\PHstrainer	81
\PHtattooedHead	81

\PHTiara (▲)	81	planets	71	\preceq (≤)	33
\PHTunny (¤)	81	playing cards	see card suits	\preceqq (≤̄)	31
\PHvine (¶)	81	Plimsoll line	104	\precnapprox (≈̄)	32
\PHwavyBand ()	81	\Plus (+)	76	\precnapprox (≈̄̄)	31
\PHwoman (¶)	81	\plus (+)	24	\precnapprox (≈̄̄̄)	34
physical symbols	70	plus-or-minus sign	see \pm	\precneq (≲)	32
\Pi (Π)	50	\PlusCenterOpen (⊕)	76	\precneqq (≲̄)	31
\pi (π)	50	\pluscirc (⊕)	23	\precnsim (≳)	32
\pi (π)	51	\PlusOutline (⊕)	76	\precnsim (≳̄)	31
\Pickup (○)	73	plusses	76, 77	\precnsim (≳̄̄)	34
pict2e (package)	70	\PlusThinCenterOpen (⊕)	76	\precsim (≾)	32
pifont (package)	10, 75–78, 80, 103, 119, 120	\Pluto (♺)	71	\precsim (≾̄)	30
pigpen (package)	98, 119, 120	\Pluto (♻)	71	\precsim (≾̄̄)	33
pigpen cipher	98	\pluto (♺)	71	prescription	see \textrecip
{\pigpenfont A} (⊣)	98	\pm (±)	22	present-value symbols	108
{\pigpenfont B} (⊤)	98	\pm (±)	24	\prime (')	65
{\pigpenfont C} (⊣)	98	\pm (±̄)	95	\prime (')	66
{\pigpenfont D} (⊲)	98	\pmb	113	\Printer (🖨)	72
{\pigpenfont E} (□)	98	\pmbboxdraw (package)	97, 119, 120	printer's fist	see fists
{\pigpenfont F} (⊴)	98	\pmmod	49	probabilistic independence	106
{\pigpenfont G} (⊸)	98	\pod	49	\prod (Π)	25
{\pigpenfont H} (⊶)	98	\pointer (◊)	88	\prod (Π)	29
{\pigpenfont I} (⊸)	98	pointing finger	see fists	projective space (P)	see alphabets, math
{\pigpenfont J} (⊣)	98	\Pointinghand (☞)	90	\projlim (projlim)	49
{\pigpenfont K} (⊣)	98	\polishhook (¸)	18	pronunciation symbols	see phonetic symbols
{\pigpenfont L} (⊣)	98	\polter (████)	63	proof, end of	65
{\pigpenfont M} (⊸)	98	polotonikogreek (babel package op- tion)	50	proper subset/superset	see \subsetneq/\supsetneq
{\pigpenfont N} (□)	98	polygons	78, 79	proper vertices	74
{\pigpenfont O} (⊴)	98	\polynom (package)	59	\proto (∞)	66
{\pigpenfont P} (⊸)	98	polynomial division	59	\proto (∞)	30
{\pigpenfont Q} (⊸)	98	polytonic Greek	50	\proto (∞)	33
{\pigpenfont R} (⊶)	98	\Postbox (✉)	98	proto-Semitic symbols	81
{\pigpenfont S} (⊸)	98	PostScript	51, 69, 75, 103, 112	protosem (package)	81, 119, 120
{\pigpenfont T} (>)	98	PostScript fonts	75, 103	\ProvidesPackage	119
{\pigpenfont U} (<)	98	\Pound (₩)	19	\PrtSc (🖨)	72
{\pigpenfont V} (Λ)	98	\pounds (£)	9, 115, 116	\ps (ω)	95
{\pigpenfont W} (⊸)	98	power set	see alphabets, math	pseudographics	97
{\pigpenfont X} (>)	98	\powerset (℘)	52	\Psi (Ψ)	50
{\pigpenfont Y} (<)	98	\Pp (:)	95	\psi (ψ)	50
{\pigpenfont Z} (Λ)	98	\pp (:	95	\psiup (ψ)	50
pilcrow	see \P	\ppm (..)	95	\psnfss (package)	77
pipe	see \textpipe	\Ppp (:)	95	\Pu (.)	89
\Pisces (♓)	71	\ppp (::)	95	pullback diagrams	106
\pisces (♓)	71	\Pppp (::)	95	pulse diagram symbols	70
\Pisymbol	103	\pppp (::)	95	\PulseHigh (⊸)	70
\pitchfork (◊)	66	\Ppppp (::)	95	\PulseLow (⊸)	70
\pitchfork (◊)	30	\prec (≺)	30	punctuation	10
\pitchfork (◊)	47	\prec (≺̄)	32	pushout diagrams	106
pitchfork symbols	30, 47, 66	\precapprox (≈̄)	32	\pwedge (Δ)	13
Pitman's base-12 symbols	65	\precapprox (≈̄̄)	32	\pxfonts (package)	21–23, 27, 30, 31, 36–38, 41, 42, 48, 50–52, 65, 66, 68, 100, 115
\piup (π)	50	\precapprox (≈̄̄̄)	30	\Pxp (:)	95
\planck (h)	13	\precapprox (≈̄̄̄̄)	30	\pxp (:)	95
\Plane (✈)	80	\precapprox (≈̄̄̄̄̄)	33		
		\preccurlyeq (≤̄)	32		
		\preccurlyeq (≤̄̄)	30		
		\preccurlyeq (≤̄̄̄)	33		
		\precdot (≺̄)	32		
		\preceq (≤̄̄̄̄)	30		

Q

Q.E.D.	65
\qoppa (ߵ)	87
\qside (߷)	93
\Quadrad (߷)	57

\quadrad (]	57
\Quadras ([])	57
\quadras ([])	57
quarter note	<i>see</i> musical symbols
\quaternnote (J)	88
\quaternnote (J)	88
quaternions (\mathbb{H})	<i>see</i> alphabets, math
quaver	<i>see</i> musical symbols
queen	94
\quotedblbase („)	10, 117
\quotesinglbase („)	10, 117
R	
\R (~)	95
\r (⌚)	14
\r (~)	95
\Radiation (☢)	92
radicals	<i>see</i> \sqrt and \surd
\Radioactivity (☢)	74
\Rain (🌧)	91
\RainCloud (Nimbus)	91
raising	<i>see</i> \textraising
\RaisingEdge (↑)	70
\Rangle (>)	68
\rAngle (⟨⟩)	56
\rangle (⟨)	21, 54
\rangle (⟨)	55
\ranglebar (⟨)	55
\RArrow (➡)	72
\arrowfill	62
\ratio (:)	36
\RATIONAL (Q)	49
\Rational (Q)	49
rational numbers (\mathbb{Q})	<i>see</i> alphabets, math
rationalized Planck constant	<i>see</i> \hbar
\Rbag (⌚)	53
\rbag (⌚)	53
\rbrace ({})	55
\Rbrack ([])	68
\rBrack ([])	56
\rc (⌚)	16
\rCeil (⌈)	56
\rceil (⌈)	54
\rceil (⌈)	55
\rcirclearrowdown (⌚)	44
\rcirclearrowleft (⌚)	44
\rcirclearrowright (⌚)	44
\rcirclearrowup (⌚)	44
\rcircleleftint (ֆ)	29
\rcirclerightint (ֆ)	29
\rcorners (⌚)	53
\rcurvearrowdown (⌚)	44
\rcurvearrowleft (⌚)	44
\rcurvearrowne (⌚)	44
\rcurvearrownw (⌚)	44
\rcurvearrowright (⌚)	44
\rcurvearrowse (⌚)	44
\rcurvearrowsw (⌚)	44
\rcurvearrowup (⌚)	44
\rdbrack ([])	55
\Re (R)	51
\REAL (R)	49
\Real (R)	49
real numbers (\mathbb{R})	<i>see</i> alphabets, math
recipe	<i>see</i> \textrecipe
\recorder (⌚)	88
\Rectangle (▢)	80
\RectangleBold (▢)	80
rectangles	80
\RectangleThin (▢)	80
\Rectpipe (▣)	73
\Rectsteel (▣)	73
recycle (package)	99, 119
	
\recycle (.recycle)	99
recycling symbols	98, 99
reduced quadrupole moment	<i>see</i> \rqm
\reflectbox	103
registered trademark	<i>see</i> \textregistered
relational symbols	30
binary	30–32, 34–39, 47, 48
negated binary	31–33
triangle	39, 40
\Relbar (=)	48, 103
\Relbar (==)	33
\relbar (-)	48, 103
\relbar (-)	33
\Request (?)	98
\resizebox	47, 100
\Respondens (~)	95
\respondens (~)	95
response (R)	118
\restoresymbol	100
\restriction	<i>see</i> \upharpoonright
\restriction ()	42
\restriction ()	46
retracting	<i>see</i> \textretracting
\Return (➡)	72
return	<i>see</i> carriage return
	56
\rev (⌚)	56
\revD (Ⓓ)	13
\revdots (⋮)	107
\reve (՞)	13
\reveject (՞)	13
\revepsilon (՞)	13, 103
reverse solidus	<i>see</i> \textbackslash
reversed symbols	103
\reversedvideobend (⤵)	89
\revglotstop (՞)	13
\Rewind (◀)	90
\RewindToIndex (⤲)	90
\RewindToStart (⤱)	90
	55
\rfloor (⌋)	56
\rfloor (⌋)	54
	55
\rfloor (⌋)	55
	54
\rfloor (⌋)	55
\RHD (▶)	23
\rhd (▷)	22, 23
\rhd (▷)	39, 40
\rho (ρ)	50
\rho (ρ)	51
\rhookdownarrow (↓)	44
\rhookleftarrow (←)	44
\rhooknearrow (↗)	44
\rhooknwarrow (↖)	44
\rhookrightarrow (→)	44
\rhooksearrow (↘)	44
\rhookswarrow (↙)	43
\rhookuparrow (↑)	43
\rho (ρ)	50
\right	54, 56, 100, 102
\rightangle (∟)	67
\RIGHTArrow (▶)	88
\Rightarrow (⇒)	21, 41
\Rightarrow (⇒)	43
\rightarrow (→)	42
\rightarrow (→)	41
\rightarrow (→)	43
\rightarrowtail (→)	41
\rightarrowtail (→)	43
\rightarrowtriangle (→)	42
\rightbarharpoon (⇒)	43
\RIGHTCIRCLE (●)	88
\RIGHTcircle (●)	88
\Rightcircle (●)	88
\RightDiamond (◆)	79
	56
\rightfilledspoon (→)	47
\rightfootline (→)	33
\rightfree (→)	33
\righthalfcap (ㄱ)	24
\righthalfcup (ㄴ)	24
\righthand (❖)	76
\rightharpoonccw (→)	46
\rightharpooncw (→)	46
\rightharpoondown (→)	43
\rightharpoondown (→)	41
\rightharpoonup (→)	43
\rightharpoonup (→)	41
\rightleftarrows (⇄)	42
\rightleftarrows (⇄)	41
\rightleftarrows (⇄)	43
\rightleftharpoon (→)	43

script letters	<i>see alphabets, math</i>
\scripta (a)	13
\scriptg (g)	13
\scriptscriptstyle	105, 106
\scriptstyle	105, 106
\scriptv (v)	13
\Scroll (⟨Scroll⟩)	72
\scu (U)	13
\scy (Y)	13
\sddtstile ()	35
\sdststile ()	35
\sdtstile ()	35
\sdttstile ()	35
seagull	<i>see \textseagull</i>
\Searrow (↖)	42
\Searrow (↗)	43
\searrow (↘)	42
\searrow (↙)	41, 106
\searrow (↙)	43
\searrowtail (↖)	43
\sec (sec)	49
\Sech (♪)	89
\SechBL (♩)	89
\SechBl (♩)	89
\SechBR (♫)	89
\SechBr (♫)	89
\second (〃)	66
seconds, angular	<i>see \second</i>
\secstress (,)	18
section mark	<i>see \S</i>
\SectioningDiamond (◊)	92
sedenions (\$)	<i>see alphabets, math</i>
\sefilledspoon (↘)	47
\sefootline (↘)	33
\sefree (↘)	33
segmented digits	70
\seharpoonccw (↘)	46
\seharpooncw (↘)	46
\selectfont	8
\selsquigarrow (↖)	43
semantic valuation	54–57
\semapsto (↖)	43
semibreve	<i>see musical symbols</i>
semidirect products	22, 23, 66
semiquaver	<i>see musical symbols</i>
semitic transliteration	14, 17
\seModels (※)	33
\semmodels (※)	33
semtrans (package)	14, 17, 119, 120
\senwarrows (↘)	43
\senharpoons (↘)	46
\SePa (↷)	89
\separated (())	33
\sepitchfork (※)	47
\seppawns (○○)	93
\SerialInterface (▣)	72
\SerialPort (≡)	72
\sersquigarrow (↖)	43
\sesearrows (↘)	43
\sespoon (↘)	47
set operators	
intersection	<i>see \cap</i>
membership	<i>see \in</i>
union	<i>see \cup</i>
\setminus (＼)	22
\setminus (＼)	24
\seVdash (⊤)	32
\seVdash (⊤)	33
SGML	117
sha (III)	103
\sharp (#)	65, 88
\sharp (#)	66
\shfermion (○)	74
\Shift (⟨Shift ↑⟩)	72
\shift (↑)	21
\Shilling (β)	18
\shneg (↑)	21
\shortcastling (O-O)	93
\shortdownarrow (↓)	42
\ShortFifty (⌚)	90
\ShortForty (⌚)	90
\shortleftarrow (←)	42
\shortmid (׀)	30
\shortmid (׀)	24
\ShortNinetyFive (⌚)	90
\shortparallel (׀)	30
\shortparallel (׀)	32
\ShortPulseHigh (✉)	70
\ShortPulseLow (✉)	70
\shortrightarrow (→)	42
\ShortSixty (⌚)	90
\ShortThirty (⌚)	90
\shortuparrow (↑)	42
\showclock	91
\shpos (↓)	21
shuffle (package)	24, 119, 120
\shuffle (✉)	24
shuffle product (✉)	24
\SI (✿)	72
\Sigma (Σ)	50
\sigma (σ)	50
\sigmaup (σ)	50
\sim (~)	30, 104, 115
\sim (~)	32
\simcolon (~:)	36
\simcoloncolon (~::)	36
\simeq (≈)	30
\simeq (≈)	32
simplewick (package)	109
simpsons (package)	96, 119
Simpsons characters	96
\sin (sin)	49
\sincoh (↶)	36
\sinh (sinh)	49
\SixFlowerAlternate (✿)	78
\SixFlowerAltPetal (✿)	78
\SixFlowerOpenCenter (✿)	78
\SixFlowerPetalDotted (✿)	78
\SixFlowerPetalRemoved (✿)	78
\SixFlowerRemovedOpenPetal (✿)	78
\SixStar (★)	78
\SixteenStarLight (★)	78
sixteenth note	<i>see musical symbols</i>
\sixteenthnote (♪)	88
skak (package)	93, 94, 119, 120
skull (package)	93, 119, 120
\skull (☠)	93
\slash (/)	115
\slashb (þ)	13
\slashc (ø)	13
\slashd (đ)	13
\slashdiv (÷)	23
slashed (package)	105
\slashed	105
slashed letters	105
slashed.sty (file)	105
\slashu (ȝ)	13
\Sleet (ȝ)	91
\sliding (▣)	16
\smallbosonloops (ℳ)	74
\smallbosonloopAs (ℳ)	74
\smallbosonloopVs (ℳ)	74
\SmallCircle (○)	79
\SmallCross (×)	79
\smalldiamond (◊)	25
\SmallDiamondshape (◊)	79
\smallfrown (⌿)	30
\smallfrown (⌿)	48
\SmallHBar (▬)	79
\smallin (ε)	52
\smallint (ʃ)	66
\SmallLowerDiamond (♦)	79
\smalllozenge (◊)	79
\smallowns (϶)	52
\smallpencil (✎)	76
\smallprod (Π)	23
\SmallRightDiamond (♦)	79
\smallsetminus (＼)	22
\smallsetminus (＼)	24
\smallsmile (⌿)	30
\smallsmile (⌿)	48
\SmallSquare (□)	79
\smallsquare (▫)	25
\smallstar (✿)	25
\SmallTriangleDown (▽)	79
\smalltriangledown (▽)	25
\smalltriangledown (▽)	25, 40
\SmallTriangleLeft (◀)	79
\smalltriangleleft (◀)	25
\smalltriangleleft (◀)	25, 40
\SmallTriangleRight (▷)	79
\smalltriangleright (▷)	25
\smalltriangleright (▷)	25, 40
\SmallTriangleUp (△)	79
\smalltriangleup (△)	25

\staveLI (97
\staveLII (97
\staveLIII (97
\staveLIV (97
\staveLIX (98
\staveLV (97
\staveLVI (97
\staveLVII (97
\staveLVIII (98
\staveLX (98
\staveLXI (98
\staveLXII (98
\staveLXIII (98
\staveLXIV (98
\staveLXV (98
\staveLXVI (98
\staveLXVII (98
\staveLXVIII (98
staves	97
staves (package)	97, 119
\staveV (97
\staveVI (97
\staveVII (97
\staveVIII (97
\staveIX (97
\staveXI (97
\staveXII (98
\staveXIII (98
\staveXIV (98
\staveXIX (98
\staveXL (98
\staveXLI (98
\staveXLII (98
\staveXLIII (98
\staveXLIV (98
\staveXLIX (97
\staveXLV (98
\staveXLVI (98
\staveXLVII (97
\staveXLVIII (97
\staveXV (98
\staveXVI (98
\staveXVII (98
\staveXVIII (98
\staveXX (98
\staveXXI (98
\staveXXII (98
\staveXXIII (98
\staveXXIV (97
\staveXXIX (97
\staveXXV (97
\staveXXVI (97
\staveXXVII (97
\staveXXVIII (97
\staveXXX (97
\staveXXXI (97
\staveXXXII (97
\staveXXXIII (97
\staveXXXIV (97
\staveXXXIX (98
\staveXXXV (98
\staveXXXVI (98
\staveXXXVII (98
\staveXXXVIII (98
\stdtstile (35
\steaming (67
steinmetz (package)	70, 119, 121
Steinmetz phasor notation	70
sterling	see \pounds
stick figures	81
\Stigma (Γ)	87
\stigma (τ)	87
stmaryrd (package)	22, 26, 31, 37, 40, 42, 48, 53, 54, 101, 104, 118–120
stochastic independence	see \bot
\StoneMan (\blacktriangle)	91
\Stopsign (\odot)	74
\StopWatchEnd ($\odot\odot$)	91
\StopWatchStart ($\odot\odot$)	91
\stress (')	18
\strictfi (ε)	31
\strictif (\dashv)	31
\strictiff ($\varepsilon\dashv$)	31
\strokedint (f)	29
\StrokeFive (#)	92
\StrokeFour ()	92
\StrokeOne ()	92
\StrokeThree ()	92
\StrokeTwo ()	92
\stst ($^{\circ}$)	104
\stststile (35
\sttstile (35
\stttstile (35
\STX (\oplus)	72
\SUB (\rightarrow)	72
subatomic particles	74
\subcorner (16
\subdoublebar (16
\subdoublevert (16
\sublptr (16
\subrptr (16
subscripts	new symbols used in . . . 105
\Subset (\Subset)	37
\Subset (\Subset)	36
\Subset (\Subset)	37
\subset (\subset)	37
\subset (\subset)	36
\subset (\subset)	37
\subsetseteq (\subseteq)	37
\subsetseteq (\subseteq)	36
\subsetseteq (\subseteq)	37
\subsetseteqq (\subseteq)	37
\subsetseteqq (\subseteq)	36
\subsetseteqq (\subseteq)	37
\subsetsetneq (\subsetneq)	37
\subsetsetneq (\subsetneq)	36
\subsetsetneq (\subsetneq)	37
\subsetsetneqq (\subsetneqq)	37
\subsetsetneqq (\subsetneqq)	36
\subsetsetneqq (\subsetneqq)	37
\subsetsetplus (\Subset)	37
\subsetsetpluseq (\Subset)	37
subsets	36, 37
\succ (\succ)	30
\succ (\succ)	32
\succapprox (\approx)	32
\succapprox (\approx)	30
\succapprox (\approx)	32
\succapprox (\approx)	32
\succcurlyeq (\geq)	32
\succcurlyeq (\geq)	30
\succcurlyeq (\geq)	32
\succdot (\succ)	32
\succeq (\succeq)	30
\succeq (\succeq)	32
\succeqq (\succeqq)	31
\succeqq (\succeqq)	32
\succnapprox (\approx)	32
\succnapprox (\approx)	31
\succnapprox (\approx)	34
\succneq (\succneq)	32
\succneqq (\succneqq)	31
\succnsim (\approx)	32
\succnsim (\approx)	31
\succnsim (\approx)	34
\succsim (\approx)	32
\succsim (\approx)	30

\succsim (\succsim)	32	\swrsquigarrow (\swarrow)	43	logic	73
such that	103, 105	\swspoon (\swarrow)	47	magical signs	97
\suchthat (\exists)	105	\swswallows ($\swarrow\swarrow$)	43	mathematical	21–69
\sum (\sum)	25	swung dash	<i>see</i> \sim	METAFONTbook	89
\sum (Σ)	29	\swVdash (\bowtie)	33	metrical	95
\sumint (f)	29	\swvDash (\bowtie)	33	miscellaneous	65–67, 80, 88–99
\Summit (\blacktriangle)	91	\syl (\square)	16	monetary	18, 19, 68
\SummitSign (\ddagger)	91	\syllabic (,)	18	musical	20, 65, 66, 88, 89
\Sun (\odot)	71	\symA (\mathbb{A})	68	navigation	90
\Sun (\odot vs. \star vs. \odot)	101	\symAE (\mathbb{A})	68	non-commutative division	63
\Sun (\odot)	91	\symB (\mathbb{B})	68	particle physics	74
\Sun (\odot)	71	\symbolbishop ($\hat{\mathbb{A}}$)	94	Phaistos disk	81
\sun (\odot)	88	Symbol (font)	51, 103	phonetic	11–14
\SunCloud (\odot)	91	symbols		physical	70
\SunshineOpenCircled (\odot)	80	actuarial	108	pitchfork	30, 47, 66
\sup (sup)	49	alpine	91	Pitman's base-12	65
superscripts		ancient language	81–87	present value	108
new symbols used in	105	annuity	108	proto-Semitic	81
supersets	36, 37	APL	71	pulse diagram	70
supremum	<i>see</i> \sup	astrological	71	recycling	98, 99
\Supset (\supset)	37	astronomical	71, 98	relational	30
\Supset (\supset)	36	biological	74	reversed	103
\Supset (\supset)	37	block-element	97	rotated	11–13, 17, 103
\Supset (\supset)	37	body-text	9–20	safety-related	74
\Supset (\supset)	36	bold	113	scientific	70–74
\Supset (\supset)	36	box-drawing	97	Simpsons characters	96
\Supset (\supset)	37	chess	93, 94	smile	48
\Supseteq (\supseteq)	37	cipher	98	spoon	47
\Supseteq (\supseteq)	36	clock	88, 90–92	staves	97
\Supseteq (\supseteq)	37	communication	73	subset and superset	36, 37
\Supseteqq (\supseteqq)	37	computer hardware	72	technological	70–74
\Supseteqq (\supseteqq)	36	contradiction	21, 48	TeXbook	89
\Supseteqq (\supseteqq)	37	currency	18, 19, 68	transliteration	14
\Supsetneq (\supsetneq)	37	dangerous bend	89	upside-down	11–13, 17, 103, 114
\Supsetneq (\supsetneq)	36	definition	21, 108	variable-sized	25–30, 100, 102
\Supsetneq (\supsetneq)	37	dictionary	11–14, 96	weather	91
\Supsetneqq (\supsetneqq)	37	dingbat	75–80	zodiacal	71
\Supsetneqq (\supsetneqq)	36	dot	9, 63, 64, 107	symbols.tex (file)	100, 119
\Supsetneqq (\supsetneqq)	37	electrical	70	\symC (\mathbb{C})	68
\Supsetplus ($\supset+$)	37	engineering	70, 73	\symking (\mathbb{K})	94
\Supsetplusq (\supsetq)	37	extensible	47, 59–63, 70, 102, 107–109	\symknight (\mathbb{Q})	94
\surd (\sqrt)	65	Feynman diagram	74	\symOE (\mathbb{O})	68
\SurveySign (\blacktriangle)	91	Frege logic	47, 53, 65, 67	\sympawn (\mathbb{A})	94
\Swallow (\swarrow)	42	frown	48	\symqueen (\mathbb{Q})	94
\Swallow (\swarrow)	43	gates, digital logic	73	\symrook (\mathbb{R})	94
\swallow (\swarrow)	42	genealogical	88	\symUE (\mathbb{U})	68
\swallow (\swarrow)	41, 106, 107	general	88	\SYN (-)	72
\swallow (\swarrow)	43	Go stones	94		
\swallowtail (\curvearrowleft)	43	information	90	T	
\swfilledspoon (\swarrow)	47	informator	93	\T	10
\swfootline (\swarrow)	32	inverted	11–13, 17, 103	\T (\square)	17
\swfree (\swarrow)	33	keyboard	72	\T (\otimes)	95
\sharpoonccw (\swarrow)	46	Knuth's	89	\t (\square)	14
\sharpooncw (\swarrow)	46	laundry	90	\t (\otimes)	95
\swlsquigarrow (\swarrow)	43	legal	9, 19, 116	t4phonet (package)	14, 17, 119, 120
\swmapsto (\swarrow)	43	letter-like	51–53	\Tab ($\boxed{\text{ }}$)	72
\swModels (\bowtie)	33	life insurance	108	\tabcolsep	104
\swmodels (\bowtie)	33	linear logic	21–23, 25, 29–30, 36, 51, 52	tacks	30, 51
\swnearrows (\swarrow)	43	linguistic	11–14		
\swneharpoons (\swarrow)	46	log-like	49, 113		
swords	91				
\swpitchfork (\bowtie)	47				

\tailed (d)	13
\tailinvr (ł)	13
\taill (ł)	13
\tailn (ń)	13
\tailr (ł)	13
\tails (ś)	13
\tailt (ł)	13
\tailz (ż)	13
\Takt	89
\talloblong (ŀ)	22
tally markers	85, 92
\tan (tan)	49
\tanh (tanh)	49
\Tape (⌚)	80
\Taschenuhr (⌚)	91
Tate-Shafarevich group	<i>see</i> sha
\tau (τ)	50
\Taurus (♉)	71
\Taurus (♉)	71
\taurus (♉)	71
tautology	<i>see</i> \top
\tauauup (τ)	50
\tcentigrade (°C)	65
\tcmu (μ)	65
\tcohm (Ω)	65
\tcpertenthousand (‰)	65
\tcpertousand (‰)	65
\td (✉)	16
\tddtstile (✉✉✉)	35
\tdststile (✉✉✉)	35
\tdtstile (✉✉✉)	35
\tdttstile (✉✉✉)	35
technological symbols	70–74
\Telefon (☎)	73
\Telephone (☎)	92
\Telephone (☏)	98
Tennent, Bob	21
\Tent (▲)	91
\Terminus (⊗)	95
\terminus (⊗)	95
\Terminus* (⊕)	95
\terminus* (⊕)	95
\tesh (ѓ)	13
testfont.dvi (file)	111
testfont.tex (file)	111, 112
\tetartemorion (϶)	19
teubner (package)	19, 64, 87, 95, 119, 120
TeX	40, 47, 64, 70, 97, 100, 103–109, 111–113, 115, 117, 118, 122
TeXbook, The	103–107, 109, 112
symbols from	89
\text	21, 105, 106
\textacutedbl (”)	18
\textacutemacron (՚)	15
\textacutewedge (՞)	15
\textadvancing (՞)	15
\textaolig (օ)	12
\textasciacute (՚)	18, 116
\textasciibreve (՞)	18
\textasciicaron (՞)	18
\textasciicircum (՞)	9, 115, 117
\textasciidieresis (՞)	18, 116
\textasciigrave (՞)	18
\textasciimacron	115
\textasciimacron (՞)	18, 116
\textasciitilde (՞)	9, 115, 117
\textasteriskcentered (*)	9, 20
\textbabygamma (՞)	11
\textbackslash (\\)	9, 114, 115
\textbaht (฿)	18
\textbar ()	9, 114
\textbarb (՞)	11
\textbarc (՞)	11
\textbard (՞)	11
\textbardbl ()	20
\textbardotlessj (յ)	11
\textbarg (՞)	11
\textbarglotstop (՞)	11
\textbari (ի)	11
\textbarl (լ)	11
\textbaro (օ)	11
\textbarrevglotstop (՞)	11
\textbaru (ս)	11
\textbeltl (՞)	11
\textbentailyogh (ձ)	12
\textbeta (Բ)	11
\textbigcircle (○)	20
\textbktailgamma (γ)	12
\textblank (՞)	20
\textblock (█)	97
\textborn (*)	88
\textbottomtiebar (▬)	15
\textbraceleft ({})	9
\textbraceright ({})	9
\textbreve macron (՞)	15
\textbrokenbar ()	20, 116
\textbullet (•)	9, 20, 117
\textbullseye (Օ)	11
\textcelsius (°C)	70, 117
\textceltpal (՚)	11
\textcent (¢)	18, 116
\textcentoldstyle (¢)	18
\textchi (՚)	11
\textcircled (◎)	14
\textcircledP (◉)	19
\textcircumacute (՞)	15
\textcircumdot (՞)	15
\textcloseepsilon (՞)	11
\textcloseomega (՞)	11
\textcloserevepsilon (՞)	11
\textcolonmonetary (₡)	18
\textcommatailz (՞)	11
\textcomp (package)	8, 9, 14, 18–20, 41, 57, 67, 70, 88, 100, 115, 119
\textcopyleft (⌚)	19
\textcopyright (⌚)	9, 19, 116
\textcorner (՞)	11
\textcrb (b)	11
\textcrd (d)	11
\textcrd (đ)	14
\textcrg (g)	11
\textcrh (h)	11
\textcrh (հ)	14
\textcringlotstop (՞)	11
\textcrlambda (λ)	11
\textcrtwo (՞)	11
\textctc (c)	11
\textctd (d)	11
\textctdctzlig (dz)	11
\textctesh (f)	11
\textctinvglotstop (՞)	12
\textctj (j)	11
\textctjvar (յ)	12
\textctn (ն)	11
\textctstretchc (լ)	12
\textctstretchcvar (ը)	12
\textctt (t)	11
\textcttctclig (tc)	11
\textctturnt (յ)	12
\textctyogh (զ)	11
\textctz (զ)	11
\textcurrency (¤)	18, 116
\textcypr	86
\textdagger (†)	9, 20
\textdaggerdbl (‡)	9, 20
\textdbend (❖)	89
\textdbhyphen (‐)	20
\textdbhyphenchar (‐)	20
\textdblig (db)	12
\textdctzlig (dz)	11
\textdegree (°)	67, 116
\textdied (†)	88
\textdiscount (٪)	20
\textdiv (÷)	67
\textdivorced (Ո)	88
\textdkshade (▬)	97
\textdnblock (▬)	97
\textdollar (\$)	9, 18
\textdollaroldstyle (\$)	18
\textdong (đ)	18
\textdotacute (՞)	15
\textdotbreve (՞)	15
\textdoublebarersh (ƒ)	11
\textdoublebarpipe (‡)	11
\textdoublebarpipevar (‡)	12
\textdoublebarslash (≠)	11
\textdoublegrave (՞)	15
\textdoublegrave (՞)	17
\textdoublepipe ()	11
\textdoublepipevar ()	12
\textdoublevbaraccent (▬)	15
\textdoublevbaraccent (▬)	17
\textdoublevertline ()	11
\textdownarrow (↓)	41
\textdownfullarrow (↓)	12
\textdownstep (↑)	11
\textdyoghl (ձ)	11
\textdzlig (ձ)	11
\texteightoldstyle (૮)	20

\textellipsis (...)	9
\textemdash (—)	9
\textendash (–)	9
\textepsilon (ε)	11
\textepsi (ε)	14
\textesh (ʃ)	12
\textesh (ʃ)	14
\textestimated (Ө)	20
\texteuro (€)	19
\texteuro (€)	18
\texteuro (€)	18, 115, 117
\textexclamdown (¡)	9
\textfemale (♀)	12
\textfishhookr (ƒ)	12
\textfiveoldstyle (᳚)	20
\textfjlig (ƒ̄)	14
\textflorin (ƒ)	18
\textfouroldstyle (૪)	20
\textfractionsolidus (/)	67
\textfrak	68
\textfrbarn (ન)	12
\textfrhookd (દ)	12
\textfrhookdvar (દ)	12
\textfrhookt (ત)	12
\textfrtailgamma (્ય)	12
\textg (ગ)	12
\textgamma (્ય)	12
\textglobfall (૭)	12
\textglobrise (૮)	12
\textglotstop (૧)	11
\textglotstopvari (૧)	12
\textglotstopvarii (૧)	12
\textglotstopvariii (૧)	12
\textgoth	68
\textgravecircum (߂)	15
\textgravedbl (߂)	18
\textgravedot (߂)	15
\textgravemacron (߂)	15
\textgravemid (߂)	15
\textgreater (>)	9, 114
\textrgamma (્ગ)	12
\textguarani (₲)	18
\texthalflength (૦)	11
\texthardsign (܂)	11
\textheng (܂)	12
\texthmlig (܂)	12
\texthooktop (܂)	11
\texthtb (܂)	11
\texthtb (܂)	14
\texthtbardotlessj (܂)	11
\texthtbardotlessjvar (܂)	12
\texthtc (܂)	11
\texthtc (܂)	14
\texthtd (܂)	11
\texthtd (܂)	14
\texthtg (܂)	11
\texthtth (܂)	11
\texthttheng (܂)	11
\texthtk (܂)	11
\texthtk (܂)	14
\texthttp (܂)	11
\texthttp (܂)	14
\texthtq (܂)	11
\texthttailed (܂)	11
\texthtscg (܂)	11
\texthtt (܂)	11
\texthtt (܂)	14
\texthvlig (܂)	11
\textifsym	70
\textinterrobang (܂)	20
\textinterrobangdown (܂)	20
\textinvglotstop (܂)	11
\textinvomega (܂)	12
\textinvscा (܂)	12
\textinvscr (܂)	11
\textinvscripta (܂)	12
\textinvsubbridge (܂)	15
\textiota (܂)	11
\textiota (܂)	14
\textlambda (܂)	11
\textlangl (܂)	57, 114
\textlbrackdbl (܂)	57
\textleaf (܂)	88
\textleftarrow (܂)	41
\textlengthmark (܂)	11
\textless (<)	9, 114
\textlfblock (܂)	97
\textlfhookrlig (܂)	12
\textlhdbend (܂)	89
\textlhookfour (܂)	12
\textlhookp (܂)	12
\textlhookt (܂)	11
\textlhti (܂)	12
\textlhtlongi (܂)	11
\textlhtlongy (܂)	11
\textlinb	85, 86
\textlira (܂)	18
\textlnot (܂)	67, 116
\textlonglegr (܂)	11
\textlooptoprevesh (܂)	12
\textlowering (܂)	15
\textlptr (܂)	11
\textlquill (܂)	57
\textltailm (܂)	11
\textltailn (܂)	11
\textltailn (܂)	14
\textltilde (܂)	11
\textltshade (܂)	97
\textlyoghlig (܂)	11
\textmarried (܂)	88
\textmho (܂)	70
\textmidacute (܂)	15
\textminus (-)	67
\textmu (܂)	70, 116
\textmusicalnote (܂)	20
\textnaira (܂)	18
\textnineoldstyle (܂)	20
\textnrleg (܂)	12
\textnumero (܂)	20
\textObardotlessj (܂)	11
\textObullseye (܂)	12
\textohm (܂)	70
\textOlyoghlig (܂)	11
\textomega (܂)	11
\textonehalf (܂)	67, 116
\textovercross (܂)	15
\textoverw (܂)	15
\textpalhook (܂)	11
\textpalhooklong (܂)	12
\textpalhookvar (܂)	12
\textparagraph (܂)	9, 20
\textperiodcentered (܂)	9, 20, 116
\textpertenthousand (܂)	20
\textperthousand (܂)	20, 117
\textpeso (܂)	18
\textphi (܂)	11
\textpilcrow (܂)	20
\textpipe (܂)	11
\textpipe (܂)	14
\textpipevar (܂)	12
\textpm (܂)	67, 116
\textpmhg	82
\textpolhook (܂)	15
\textprimstress (܂)	11
\textproto	81
\textqplig (܂)	12
\textquestiondown (܂)	9
\textquotedbl (")	10, 114
\textquotedblleft (")	9
\textquotedblright (")	9
\textquotefirst (܂)	9
\textquoteright (܂)	9
\textquotesingle (܂)	20, 114
\textquotestraightbase (܂)	20
\textquotestraightdblbase (܂)	20
\textraiseeglotstop (܂)	11
\textraisevibyi (܂)	11
\textraising (܂)	15
\textramshorns (܂)	11
\textrangle (܂)	57, 114
\textrbrackdbl (܂)	57
\textrecipe (܂)	20, 102
\textrectangle (܂)	12
\textreferencemark (܂)	20, 21
\textregistered (܂)	9, 19, 116
\textretracting (܂)	15
\textretractingvar (܂)	12
\textrevapostrophe (܂)	11
\textreve (܂)	11
\textrevespsilon (܂)	11, 103
\textreversedvideobend (܂)	89
\textrevglotstop (܂)	11
\textrevscl (܂)	12

\textrevscr (¤)	12	\textSFiv (♩)	97	\textsuperimpostilde (֍)	16
\textrevyogh (ȝ)	11	\textSFix (֍)	97	\textsuperscript	16
\textrhooka (֍)	12	\textSFl (֍)	97	\texttsurd (√)	67
\textrooke (֍)	12	\textSFl (֍)	97	\textswab	68
\textrhookepsilon (֍)	12	\textSFl (֍)	97	\textsyllabic (֍)	16
\textrhookopeno (֍)	12	\textSFl (֍)	97	\texttctclig (֍)	11
\textrhookrevespsilon (֍)	12	\textSFl (֍)	97	\textteshlig (֍)	11
\textrhookschwa (֍)	12	\textSFv (֍)	97	\textteshlig (֍)	14
\textrhoticity (֍)	12	\textSFvi (֍)	97	\textttheta (ߠ)	11
\textrightarrow (→)	41	\textSFvii (֍)	97	\textthing (֍)	91
\textringmacron (֍)	15	\textSFviii (֍)	97	\textthorn (֍)	11
\textroundcap (֍)	15	\textSFx (֍)	97	\textthornvari (֍)	12
\textrptr (֍)	12	\textSFxi (֍)	97	\textthornvarii (֍)	12
\textrquill (֍)	57	\textSFxix (֍)	97	\textthornvariii (֍)	12
\textrtaild (֍)	12	\textSFxl (֍)	97	\textthornvariv (֍)	12
\textrtaild (֍)	14	\textSFxli (֍)	97	\textthreeoldstyle (֍)	20
\textrtailh (֍)	12	\textSFxlii (֍)	97	\textthreequarters (֍)	67, 116
\textrtaill (֍)	12	\textSFxliii (֍)	97	\textthreequartersemdash (—)	20
\textrtailn (֍)	11	\textSFxliv (֍)	97	\textthreesuperior (֍)	67, 116
\textrtailr (֍)	11	\textSFxlix (֍)	97	\texttildedot (֍)	16
\textrtails (֍)	11	\textSFxlv (֍)	97	\texttildelow (֍)	20, 115
\textrtailt (֍)	11	\textSFxlvii (֍)	97	\textttimes (֍)	67
\textrtailt (֍)	14	\textSFxlviii (֍)	97	\texttoneletterstem (֍)	11
\textrtailz (֍)	11	\textSFxlviiii (֍)	97	\texttoptiebar (֍)	16
\textrtblock (֍)	97	\textSFxx (֍)	97	\texttrademark (™)	9, 19, 117
\textrthook (֍)	11	\textSFxxi (֍)	97	\textttslig (֍)	11
\textrthooklong (֍)	12	\textSFxxii (֍)	97	\textturna (֍)	11
\textscarab	87	\textSFxxiii (֍)	97	\textturncelig (֍)	11
\textscra (֍)	11	\textSFxxiv (֍)	97	\textturnglotstop (֍)	12
\textscraig (֍)	12	\textSFxxv (֍)	97	\textturnrh (֍)	11
\textscb (֍)	11	\textSFxxvi (֍)	97	\textturnrnk (֍)	11
\textscdelta (֍)	12	\textSFxxvii (֍)	97	\textturnlonglegr (֍)	11
\textscce (֍)	11	\textSFxxviii (֍)	97	\textturnnm (֍)	11
\textscf (֍)	12	\textSFxxxix (֍)	97	\textturnmrleg (֍)	11
\textscg (֍)	11	\textSFxxxvi (֍)	97	\textturnnr (֍)	11
\textsch (֍)	11	\textSFxxxvii (֍)	97	\textturnrrtail (֍)	11
\textschwa (֍)	11	\textSFxxxviii (֍)	97	\textturnsck (֍)	12
\textschwa (֍)	14	\textshade (֍)	97	\textturnscripta (֍)	11
\textsci (֍)	11	\textsixoldstyle (6)	20	\textturnscu (֍)	12
\textscj (֍)	11	\textsoftsign (֍)	11	\textturnt (֍)	11
\textscck (֍)	12	\textspleftarrow (֍)	12	\textturnthree (֍)	12
\textscsl (֍)	11	\textsterling (֍)	9, 18	\textturntwo (֍)	12
\textscm (֍)	12	\textstretchc (֍)	11	\textturnv (֍)	11
\textscn (֍)	11	\textstretchcvar (֍)	12	\textturnw (֍)	11
\textscelig (֍)	11	\textstyle	105, 106, 113	\textturny (֍)	11
\textscomega (֍)	11	\textsubacute (֍)	15	\texttwelveudash (—)	20
\textscp (֍)	12	\textsubarch (֍)	15	\texttwooldstyle	20
\textscq (֍)	12	\textsubbar (֍)	15	\texttwooldstyle (2)	20
\textscr (֍)	11	\textsubbridge (֍)	15	\texttwosuperior (2)	67, 116
\textscripta (֍)	11	\textsubcircum (֍)	15	\textuncrfemale (֍)	12
\textscriptg (֍)	11	\textsubdot (֍)	15	\textunderscore (֍)	9
\textscriptv (֍)	11	\textsubdoublearrow (֍)	12	\textuparrowarrow (↑)	41
\textscriptv (֍)	14	\textsubgrave (֍)	15	\textupblock (֍)	97
\textscu (֍)	11	\textsubhalfring (֍)	15	\textupfullarrow (↑)	12
\textscy (֍)	11	\textsubplus (֍)	15	\textupsilon (֍)	11
\textseagull (֍)	15	\textsubrhalfring (֍)	15	\textupstep (↑)	11
\textsecstress (֍)	11	\textsubrightarrow (֍)	12	\textvbaraccent (֍)	16
\textsection (֍)	9, 20	\textsubring (֍)	15	\textvbaraccent (֍)	17
\textservicemark (֍)	19	\textsubsquare (֍)	15	\textvertline (֍)	12
\textsevenoldstyle (7)	20	\textsubtilde (֍)	15	\textvibyi (֍)	12
\textSFi (֍)	97	\textsubumlaut (֍)	15	\textvibyy (֍)	12
\textSFii (֍)	97	\textsubw (֍)	16		
\textSFiii (֍)	97	\textsubwedge (֍)	16		

unary operators	21	\Updelta (Δ)	51	\Upsilon (Υ)	50
\unclear (∞)	93	\updelta (δ)	51	\upsilon (ν)	50
\underaccent	107	\Updownarrow (\Updownarrow)	41, 54	\upsilonup ($\bar{\nu}$)	50
\underarc (\overbrace)	17	\Updownarrow (\Downarrow)	44	\upslice (Δ)	25
\underarch (\overbrace)	16	\updownarrow (\Downarrow)	41, 54	\upspoon ($\grave{\imath}$)	47
\underbrace (\overbrace)	60	\updownarrow (\Downarrow)	44	\upt (\perp)	18
\underbrace (\overbrace)	60	\updownarrows (\Updownarrow)	42	\uptau (τ)	51
\underbrace (\overbrace)	60	\updownarrows (\Downarrow)	44	\uptherefore (\therefore)	24, 64
\underbrace (\overbrace)	59	\updownharpoonleft (\Downarrow)	46	\Uptheta (Θ)	51
\underbracket (\overbrace)	60	\updownharpoonright (\Downarrow)	46	\uptheta (θ)	51
\underbracket (\overbrace)	108, 109	\updownharpoons (\Downarrow)	43	\uptdownarrow (\Downarrow)	42
\underdots (..)	18	\updownharpoons (\Downarrow)	46	\upuparrows (\upuparrows)	42
\undergroup (\overbrace)	60	\Updownline (\Downarrow)	33	\upuparrows (\upuparrows)	41
\undergroup (\overbrace)	60	\Updownline (\Downarrow)	33	\upuparrows (\upuparrows)	44
\underleftarrow (\overleftarrow)	59	\upepsilon (ε)	51	\upupharpoons (\upupharpoons)	43
\underleftharp (\overleftarrow)	47	\upeta (η)	51	\Upupsilon (Υ)	51
\underleftharpdown (\overleftarrow)	47	\upfilledspoon (\Downarrow)	47	\upupsilon (υ)	51
\underleftrightarrow (\overleftarrow)	59	\upfootline (\Downarrow)	33	\upvarepsilon (ε)	51
underline	9, 21, 59, 61	\upfree (\uparrow)	33	\upvarphi (φ)	51
\underline (\overbrace)	59	\Upgamma (Γ)	51	\upvarpi (ϖ)	51
\underlinesegment (\overbrace)	60	\upgamma (γ)	51	\upvarrho (ρ)	51
\underparenthesis (\overbrace)	108, 109	upgreek (package)	51, 119, 120	\upvarsigma (σ)	51
\underrightarrow (\overrightarrow)	59	\upharpoonccw (\Downarrow)	46	\upvartheta (ϑ)	51
\underrightharp (\overrightarrow)	47	\upharpooncw (\Downarrow)	46	\upvdash (\perp)	33
\underrightharpdown (\overrightarrow)	47	\upharpoonleft (\Downarrow)	43	\upvdash (\perp)	33
\underring (.)	18	\upharpoonleft (\Downarrow)	41	\Upxi (Ξ)	51
underscore	see underline	\upharpoonright (\Downarrow)	43	\upxi (ξ)	51
underscore (package)	9	\upharpoonright (\Downarrow)	41	\upY (λ)	24
\underset	104	\upiota (ι)	51	\upzeta (ζ)	51
\undertilde (package)	61, 119, 120	\upkappa (κ)	51	\Uranus (δ)	71
\undertilde (.)	18	\Uplambda (Λ)	51	\Uranus (\eth)	71
\underwedge (.)	18	\uplambda (λ)	51	\uranus (δ)	71
Unicode	8, 97, 117–118	\uplett	16	\urcorner (\ulcorner)	53
union	see \cup	\uplusqigarrow (\Downarrow)	44	\urcorner (\urcorner)	53
unit disk (\mathbb{D})	see alphabets, math	\uplus (\oplus)	23		1
\unitedpawns (∞)	93	\uplus (\oplus)	22	\urcorner ()	55
units (package)	67	\upmapsto (\mapsto)	44		
unity ($\mathbb{1}$)	see alphabets, math	\upModels (\models)	33	url (package)	115
universa (package)	80, 90, 119, 120	\upmodels (\models)	33	\US (\blacktriangledown)	72
universal (package)	75, 77, 80, 90, 119, 120	\upmu (μ)	51	\usepackage	8
\unlhd (\triangleleft)	22, 23	\upnu (ν)	51	\ushort (package)	61, 119, 121
\unlhd (\triangleleft)	39, 40	\Upomega (Ω)	51	\ushort (\overbrace)	61
\unrhd (\triangleright)	22, 23	\upomega (ω)	51	\ushortdw (\overbrace)	61
\unrhd (\triangleright)	39, 40	\upp (^)	18	\ushortw (\overbrace)	61
\upalpha (α)	51	\upparentfill	109	\ut (\overbrace)	16
\UParrow (\blacktriangleleft)	88	\Upphi (Φ)	51	UTF-8	117, 118
\Uparrow ($\uparrow\uparrow$)	41, 54	\upphi (ϕ)	51	utf8x (inputenc package option)	117
\Uparrow ($\uparrow\uparrow$)	44	\Uppi (Π)	51	\utilde (\overbrace)	61
\uparrow (\uparrow)	41, 54, 100	\uppi (π)	51	\utimes (\times)	24
\uparrow (\uparrow)	44	\uppitchfork (\pitchfork)	47	\utimes (\times)	24
\uparrowtail ($\uparrow\downarrow$)	44	\upproto (\wp)	33	Utopia (font)	18, 30
\upbar	16	\Uppsi (Ψ)	51		
\upbeta (β)	51	\uppsi (ψ)	51		
\upbracketfill	109	upquote (package)	115		
\upchi (χ)	51	\uprho (ρ)	51		
		upright Greek letters	50, 51		
		\uprsqigarrow (\Downarrow)	44		
		upside-down symbols	114		
		upside-down symbols	11–13, 17, 103		
		\Upsilonigma (Σ)	51		
		\upsigma (σ)	51		

V

\v (\textbf{v})	14
\vara (a)	13
\varangle (\measuredangle)	66
\varbigcirc (\circledcirc)	22
\VarClock (\odot)	91
\varclub (\clubsuit)	67
\varclubsuit (\spadesuit)	66
\varcoppa (\wp)	87
\varcurlyvee (\textbf{y})	22

\varcurlywedge (λ)	22
\vardiamond (◆)	67
\vardiamondsuit (♦)	66
\varEarth (Ø)	71
\varepsilon (ε)	50
\varepsilonup (ε)	50
\VarFlag (¶)	91
varg (txfonts/pxfonts package option)	51
\varg (g)	51
\varg (g)	13
\vageq (≥)	38
\varhash (#)	66
\varheart (♥)	67
\varheartsuit (♥)	66
\varhexagon (○)	78
\varhexstar (*)	77
\vari (ι)	13
variable-sized symbols	25–30, 100, 102
\VarIceMountain (▲)	91
\varinjlim (lim)	49
\varint (ʃ)	26
\various (R)	93
\varkappa (κ)	50
\varleq (≤)	38
\varliminf (lim)	49
\varlimsup (lim)	49
\varmathbb	68
\VarMountain (▲)	91
\varnothing (Ø)	21, 65, 66
\varnothing (Ø)	66
\varnotin (∉)	52
\varnotowner (‡)	52
\varoast (⊗)	22
\varobar (⊕)	22
\varobslash (◎)	22
\varocircle (◎)	22
\varodot (◎)	22
\varogreaterthan (⊗)	22
\varoiintclockwise (fff)	27
\varoiintctrcclockwise (fff)	28
\varoiint (ff)	28
\varoiintclockwise (ff)	28
\varoiintctrcclockwise (ff)	28
\varoint (ʃ)	26
\varointclockwise (ʃ)	28
\varointclockwise (ɸ)	28
\varointctrcclockwise (ɸ)	28
\varointclockwise (ɸ)	28
\varointctrcclockwise (ɸ)	28
\varolesthan (⊗)	22
\varomega (ω)	13
\varominus (⊖)	22
\varopeno (ɔ)	13
\varoplus (⊕)	22
\varoslash (Ø)	22
\varotimes (⊗)	22
\varovee (⊗)	22
\varowedge (⊗)	22
\varparallel (//)	31
\varparallelinv (\\)	31
\varpartialdiff (∂)	53
\varphi (φ)	50
\varphiup (φ)	50
\varpi (ϖ)	50
\varpi (ω)	51
\varpiup (ϖ)	50
\varprod (×)	28
\varprojlim (lim)	49
\varproto (α)	30
\varproto (∞)	33
\varQ (⌚)	90
\varrho (ρ)	50
\varrho (ρ)	51
\varrhoup (ρ)	50
\varsigma (ς)	50
\varsigmaup (ς)	50
\varspade (♣)	67
\varspadesuit (♣)	66
\varsqsubsetneq (⊈)	37
\varsqsubsetneqq (⊉)	37
\varsqsupsetneq (⊉)	37
\varsqsupsetneqq (⊊)	37
\varstar (*)	23
\varstigma (ξ)	87
\varsubsetneq (⊊)	37
\varsubsetneqq (⊋)	36
\varsubsetneq (⊊)	37
\varsubsetneqq (⊋)	37
\varsubsetneqq (⊋)	36
\varsubsetneqq (⊋)	37
\varsubsetneqq (⊋)	36
\varsubsetneqq (⊋)	37
\varsummit (△)	91
\varupsetneq (⊋)	37
\varupsetneq (⊋)	36
\varupsetneq (⊋)	37
\varupsetneqq (⊋)	37
\varupsetneqq (⊋)	36
\varupsetneqq (⊋)	37
\varTaschenuhr (⌚)	91
\vartheta (ϑ)	50
\varthetaup (ϑ)	50
\vartimes (X)	22
\vartriangle (Δ)	66
\vartriangle (Δ)	40
\vartriangleleft (⊣)	40
\vartriangleleft (⊣)	39
\vartriangleleft (⊣)	39, 40
\vartriangleright (⇒)	40
\vartriangleright (⇒)	39
\vartriangleright (⇒)	39, 40
\varv (v)	51
\varvarpi (ϖ)	51
\varvarrho (ρ)	51
\varw (w)	51
\vary (y)	51
\VBar ()	79
\vbiproto (8)	24
\vcntcolon (:)	34
\vcenter	104
\vcrossing (χ)	33
\VDash (=)	32
\Vdash (=)	32
\Vdash (=)	30
\vdash (-)	30
\vdash (-)	33
\vdotdot (:)	24, 64
\vdots (⋮)	63
\vdots (⋮)	64
\vec (→)	58
\vec (→)	57
\Vectorarrow (→)	67
\Vectorarrowhigh (→)	67
\vee (∨)	23
\vee (∨)	22
\vee (∨)	24
\veebar (↙)	23
\veebar (↘)	22
\veedot (↙)	24
\veedoublebar (⊒)	23
\Venus (♀)	71
\Venus (♀)	71
\venus (♀)	71
\vernal (ℳ)	71
versicle (℣)	118
\VERT (☰)	57
\Vert ()	54, 56
\vert ()	54, 56
\vertbowtie (⤙)	24
\vertdiv (⤚)	24
\WHF (≈)	70
\Wier (◐)	89
vietnam (package)	119
\Village (↑↑)	91
\vin (˩)	53
vinculum	see \overline
\ViPa (׀)	89
\Virgo (♍)	71
\virgo (♍)	71
\VM (>)	89
\vntex (package)	10, 14
\vod (v)	13
\voicedh (fi)	13
\vppm (፣)	95
\vpppm (፣)	95
\vrule	97
\WT (σ̄)	72
\vv (⤙)	61
\VvDash (=)	31
\VvDash (=)	32
\VvDash (=)	30
\VvDash (=)	33
\vvvert (☰)	55

W

\WashCotton (washer) 90
\WashSynthetics (washer) 90

\WashWool (⌚)	90
\wasyllozenge (▣)	88
\wasypyproto (♾)	31
wasysym (package)	13, 18, 20, 22, 23, 26, 30, 31, 36–38, 41, 64–66, 70, 71, 73, 77, 78, 88, 101, 119, 120
\wasythefore (:)	64
wavy-line delimiters	55, 56
\wbetter (±)	93
\wdecisive (+–)	93
\weakpt (✗)	93
\WeakRain (weathermap)	91
\WeakRainCloud (weathermap)	91
weather symbols	91
\Wecker (⌚)	91
\wedge (∧)	23
\wedge (∧)	22
\wedge (∧)	24
\wedgedot (Ⓐ)	24
Weierstrass \wp function	see \wp
\wfermion (Ϝ)	74
\Wheelchair (♿)	90
\whermion (Ϝ)	74
\whistle (♫)	16
\WhiteBishopOnBlack (♝)	94
\WhiteBishopOnWhite (♝)	94
\WhiteEmptySquare (□)	94
\WhiteKingOnBlack (♚)	94
\WhiteKingOnWhite (♚)	94
\WhiteKnightOnBlack (♞)	94
\WhiteKnightOnWhite (♞)	94
\WhitePawnOnBlack (♟)	94
\WhitePawnOnWhite (♟)	94
\WhiteQueenOnBlack (♛)	94
\WhiteQueenOnWhite (♛)	94
\WhiteRookOnBlack (♜)	94
\WhiteRookOnWhite (♜)	94
\whitestone	94
whole note	see musical symbols
Wick contractions	109
\widearc (⏜)	60
\widearrow (⏜)	60
\widebar (⏜)	60
\widecheck (⏜)	60
\widehat (⏜)	60
\widehat (⏜)	59
\wideOarc (⏜)	60
\wideparen (⏜)	60
\wideparen (⏜)	60
\wideparen (⏜)	60
\wideparen (⏜)	59
\widetilde (⏜)	60
\widetilde (⏜)	59, 61
\widetriangle (⏜)	59
\wind	91
window	90
Windows®	115
\with (&)	24
\with (└)	93
\withattack (→)	93
\withidea (△)	93
\withinit (↑)	93
\without (⊍)	93
\wn (?)	21
woman	81, 90
\Womanface (👩)	90
won	see \textwon
world	90
\wp (wp)	51
\wp (wp)	52
\wr (wr)	22
\wr (wr)	24
\wreath (wr)	24
wreath product	see \wr
\Writinghand (✍)	90
wsipa (package)	13, 16, 18, 101, 103, 107, 119, 120
\upperhand (±)	93
X	
\x (ȝ)	65
\x (ɔ:)	95
\XBox (☒)	77
Xdvi	47, 103
X _L AT _E X	118
xfrac (package)	67
\xhookleftarrow (⤠)	62
\xhookrightarrow (⤠)	62
\Xi (Ξ)	50
\xi (ξ)	50
\xiup (ξ)	50
\xLeftarrow (⤠)	62
\xleftarrow (⤠)	61
\xleftharpoondown (⤠)	62
\xleftharpoonup (⤠)	62
\xLeftrightarrow (⤠)	62
\xleftrightarrow (⤠)	62
\xleftrightarrow (⤠)	62
\xleftrightarrow (⤠)	62
\xleftrightharpoons (⤠)	62
\xlongequal (⤠)	63
\xlongequal (⤠)	62
\xLongleftarrow (⤠)	62
\xlongleftarrow (⤠)	62
\xLongleftrightarrow (⤠)	62
\xlongleftrightarrow (⤠)	62
\xLongrightarrow (⤠)	62
\xlongrightarrow (⤠)	62
\xmapsto (⤠)	62
\xmapsto (⤠)	63
XML	117
\xRightarrow (⤠)	62
\xrightarrow (⤠)	61
\xrighttharpoondown (⤠)	62
\xrighttharpoonup (⤠)	62
\xrightleftharpoons (⤠)	62
\xrightleftharpoons (⤠)	62
Xs	77, 90
\XSolid (☒)	77
\XSolidBold (☒)	77
\XSolidBrush (☒)	77
\xswordsdown (☒)	91
\xswordsup (☒)	91
\xtwoheadleftarrow (⤠)	63
\xtwoheadrightarrow (⤠)	63
Xy-pic	106
Y	
\Ydown (ȝ)	22
yen	see \textyen
yfonts (package)	68, 69, 119, 120
yhmath (package)	58, 59, 61, 64, 107, 119
\Yinyang (☯)	90
\Yleft (⤠)	22
\yogh (ȝ)	13
\yogh (ȝ)	13
\Yright (⤠)	22
Yu, Billy	108
\Yup (ȝ)	22
Z	
Zapf Chancery (font)	68
Zapf Dingbats (font)	75, 77
\Zborder (☒)	80
\zeta (ζ)	50
\zetaup (ζ)	50
\Zodiac	71
zodiacal symbols	71
\Ztransf (⤠)	36
\ztransf (⤠)	36
\zugzwang (⊙)	93
\Zwdr (♪)	89
\ZwPa (ȝ)	89