The Comprehensive LaTeX Symbol List

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Abstract

This document lists 5913 symbols and the corresponding LaTeX commands that produce them. Some of these symbols are guaranteed to be available in every LaTeX 2ε system; others require fonts and packages that may not accompany a given distribution and that therefore need to be installed. All of the fonts and packages used to prepare this document—as well as this document itself—are freely available from the Comprehensive TeX Archive Network (http://www.ctan.org/).

Contents

Contents **1**

1 Introduction **8**
1.1 Document Usage . . . 8
1.2 Frequently Requested Symbols . . . 8

2 Body-text symbols **9**
Table 1: LaTeX 2ε Escapable "Special" Characters . . . 9
Table 2: Predefined LaTeX 2ε Text-mode Commands . . . 9
Table 3: LaTeX 2ε Commands Defined to Work in Both Math and Text Mode . . . 9
Table 4: $\mathcal{AMS}$ Commands Defined to Work in Both Math and Text Mode . . . 10
Table 5: Non-ASCII Letters (Excluding Accented Letters) . . . 10
Table 6: Letters Used to Typeset African Languages . . . 10
Table 7: Letters Used to Typeset Vietnamese . . . 10
Table 8: Punctuation Marks Not Found in OT1 . . . 10
Table 9: pifont Decorative Punctuation Marks . . . 10
Table 10: tipa Phonetic Symbols . . . 11
Table 11: tipx Phonetic Symbols . . . 12
Table 12: wsuipa Phonetic Symbols . . . 13
Table 13: wasysym Phonetic Symbols . . . 13
Table 14: phonetic Phonetic Symbols . . . 13
Table 15: t4phonet Phonetic Symbols . . . 14
Table 16: semtrans Transliteration Symbols . . . 14
Table 17: Text-mode Accents . . . 14
Table 18: tipa Text-mode Accents . . . 15
Table 19: extraipa Text-mode Accents . . . 16
Table 20: wsuipa Text-mode Accents . . . 16
Table 21: phonetic Text-mode Accents . . . 16
Table 22: metre Text-mode Accents . . . 17
Table 23: t4phonet Text-mode Accents . . . 17
Table 24: arcs Text-mode Accents . . . 17
Table 25: semtrans Accents . . . 17
Table 26: ogonek Accents . . . 17
Table 27: combelow Accents . . . 17

*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: LaTeX2e 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: $\mathcal{AMS}$ Binary Operators . . . 22
Table 46: stmaryrd Binary Operators . . . 22
Table 47: wasysym Binary Operators . . . 23
Table 48: txfonts/pxfonts 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: $\mathcal{AMS}$ 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/pxfonts 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: $\mathcal{AMS}$ Binary Relations . . . 30
Table 69: $\mathcal{AMS}$ Negated Binary Relations . . . 31
Table 70: stmaryrd Binary Relations . . . 31
Table 71: wasysym Binary Relations . . . 31
Table 72: txfonts/pxfonts Binary Relations . . . 31
Table 73: txfonts/pxfonts 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: $\mathcal{AMS}$ 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: $\mathcal{AMS}$ 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: $\mathcal{AMS}$ 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: $\mathcal{AMS}$ Arrows . . . 41
Table 106: $\mathcal{AMS}$ Negated Arrows . . . 41
Table 107: $\mathcal{AMS}$ 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: $\mathcal{AMS}$ Log-like Symbols . . . 49
Table 130: LaTeX2e Number Sets . . . 49
Table 131: Greek Letters . . . 50
Table 132: $\mathcal{AMS}$ 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: $\mathcal{AMS}$ Hebrew Letters . . . 51
Table 138: MnSymbol Hebrew Letters . . . 51
Table 139: Letter-like Symbols . . . 51
Table 140: $\mathcal{AMS}$ Letter-like Symbols . . . 52

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

Table 198: fge Digits . . . 65
Table 199: dozenal Base-12 Digits . . . 65
Table 200: mathabx Mayan Digits . . . 65
Table 201: Miscellaneous LaTeX 2ε Math Symbols . . . 65
Table 202: Miscellaneous AMS Math Symbols . . . 66
Table 203: Miscellaneous wasysym Math Symbols . . . 66
Table 204: Miscellaneous txfonts/pxfonts Math Symbols . . . 66
Table 205: Miscellaneous mathabx Math Symbols . . . 66
Table 206: Miscellaneous MnSymbol Math Symbols . . . 66
Table 207: Miscellaneous Internal MnSymbol Math Symbols . . . 67
Table 208: Miscellaneous textcomp Text-mode Math Symbols . . . 67
Table 209: Miscellaneous marvosym Math Symbols . . . 67
Table 210: Miscellaneous fge Math Symbols . . . 67
Table 211: Miscellaneous mathdesign Math Symbols . . . 67
Table 212: Miscellaneous arev Math Symbols . . . 67
Table 213: Math Alphabets . . . 68

4 Science and technology symbols **70**
Table 214: gensymb Symbols Defined to Work in Both Math and Text Mode . . . 70
Table 215: wasysym Electrical and Physical Symbols . . . 70
Table 216: ifsym Pulse Diagram Symbols . . . 70
Table 217: ar Aspect Ratio Symbol . . . 70
Table 218: textcomp Text-mode Science and Engineering Symbols . . . 70
Table 219: steinmetz Extensible Phasor Symbol . . . 70
Table 220: wasysym Astronomical Symbols . . . 71
Table 221: marvosym Astronomical Symbols . . . 71
Table 222: mathabx Astronomical Symbols . . . 71
Table 223: wasysym APL Symbols . . . 71
Table 224: wasysym APL Modifiers . . . 71
Table 225: marvosym Computer Hardware Symbols . . . 72
Table 226: keystroke Computer Keys . . . 72
Table 227: ascii Control Characters (CP437) . . . 72
Table 228: milstd Logic Gates . . . 73
Table 229: marvosym Communication Symbols . . . 73
Table 230: marvosym Engineering Symbols . . . 73
Table 231: wasysym Biological Symbols . . . 73
Table 232: marvosym Biological Symbols . . . 74
Table 233: marvosym Safety-related Symbols . . . 74
Table 234: feyn Feynman Diagram Symbols . . . 74

5 Dingbats **75**
Table 235: bbding Arrows . . . 75
Table 236: pifont Arrows . . . 75
Table 237: universal Arrows . . . 75
Table 238: marvosym Scissors . . . 75
Table 239: bbding Scissors . . . 75
Table 240: pifont Scissors . . . 75
Table 241: dingbat Pencils . . . 76
Table 242: bbding Pencils and Nibs . . . 76
Table 243: pifont Pencils and Nibs . . . 76
Table 244: dingbat Fists . . . 76
Table 245: bbding Fists . . . 76
Table 246: pifont Fists . . . 76
Table 247: fourier Fists . . . 76
Table 248: bbding Crosses and Plusses . . . 76
Table 249: pifont Crosses and Plusses . . . 77
Table 250: bbding Xs and Check Marks . . . 77
Table 251: pifont Xs and Check Marks . . . 77

Table 252: wasysym Xs and Check Marks . . . 77
Table 253: universal Xs . . . 77
Table 254: pifont Circled Numbers . . . 77
Table 255: wasysym Stars . . . 77
Table 256: bbding Stars, Flowers, and Similar Shapes . . . 78
Table 257: pifont Stars, Flowers, and Similar Shapes . . . 78
Table 258: fourier Ornaments . . . 78
Table 259: wasysym Geometric Shapes . . . 78
Table 260: MnSymbol Geometric Shapes . . . 79
Table 261: ifsym Geometric Shapes . . . 79
Table 262: bbding Geometric Shapes . . . 80
Table 263: pifont Geometric Shapes . . . 80
Table 264: universa Geometric Shapes . . . 80
Table 265: universal Geometric Shapes . . . 80
Table 266: Miscellaneous dingbat Dingbats . . . 80
Table 267: Miscellaneous bbding Dingbats . . . 80
Table 268: Miscellaneous pifont Dingbats . . . 80

6 Ancient languages **81**
Table 269: phaistos Symbols from the Phaistos Disk . . . 81
Table 270: protosem Proto-Semitic Characters . . . 81
Table 271: hieroglf Hieroglyphics . . . 82
Table 272: linearA Linear A Script . . . 82
Table 273: linearb Linear B Basic and Optional Letters . . . 85
Table 274: linearb Linear B Numerals . . . 85
Table 275: linearb Linear B Weights and Measures . . . 85
Table 276: linearb Linear B Ideograms . . . 86
Table 277: linearb Unidentified Linear B Symbols . . . 86
Table 278: cypriot Cypriot Letters . . . 86
Table 279: sarabian South Arabian Letters . . . 87
Table 280: teubner Archaic Greek Letters and Greek Numerals . . . 87

7 Other symbols **88**
Table 281: textcomp Genealogical Symbols . . . 88
Table 282: wasysym General Symbols . . . 88
Table 283: wasysym Circles . . . 88
Table 284: wasysym Musical Symbols . . . 88
Table 285: arev Musical Symbols . . . 88
Table 286: harmony Musical Symbols . . . 89
Table 287: harmony Musical Accents . . . 89
Table 288: manfnt Dangerous Bend Symbols . . . 89
Table 289: Miscellaneous manfnt Symbols . . . 89
Table 290: marvosym Navigation Symbols . . . 90
Table 291: marvosym Laundry Symbols . . . 90
Table 292: marvosym Information Symbols . . . 90
Table 293: Other marvosym Symbols . . . 90
Table 294: Miscellaneous universa Symbols . . . 90
Table 295: Miscellaneous universal Symbols . . . 90
Table 296: Miscellaneous fourier Symbols . . . 91
Table 297: ifsym Weather Symbols . . . 91
Table 298: ifsym Alpine Symbols . . . 91
Table 299: ifsym Clocks . . . 91
Table 300: Other ifsym Symbols . . . 92
Table 301: clock Clocks . . . 92
Table 302: epsdice Dice . . . 92
Table 303: hhcount Dice . . . 92
Table 304: hhcount Tally Markers . . . 92
Table 305: skull Symbols . . . 93

Table 306: Non-Mathematical mathabx Symbols . . . 93
Table 307: skak Chess Informator Symbols . . . 93
Table 308: skak Chess Pieces and Chessboard Squares . . . 94
Table 309: igo Go Stones . . . 94
Table 310: metre Metrical Symbols . . . 95
Table 311: metre Small and Large Metrical Symbols . . . 95
Table 312: teubner Metrical Symbols . . . 95
Table 313: dictsym Dictionary Symbols . . . 96
Table 314: simpsons Characters from *The Simpsons* . . . 96
Table 315: pmboxdraw Box-Drawing Symbols . . . 97
Table 316: staves Magical Staves . . . 97
Table 317: pigpen Cipher Symbols . . . 98
Table 318: LaTeX2e Phases of the Moon . . . 98
Table 319: Other LaTeX2e Symbols . . . 98
Table 320: recycle 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 LaTeX Symbol List! This document strives to be your primary source of LaTeX symbol information: font samples, LaTeX commands, packages, usage details, caveats—everything needed to put thousands of different symbols at your disposal. All of the fonts covered herein meet the following criteria:

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

These are not particularly limiting criteria; the Comprehensive LaTeX Symbol List contains samples of 5913 symbols—quite a large number. Some of these symbols are guaranteed to be available in every LaTeX 2_ε system; others require fonts and packages that may not accompany a given distribution and that therefore need to be installed. See `http://www.tex.ac.uk/cgi-bin/texfaq2html?label=instpackages+wherefiles` for help with installing new fonts and packages.

1.1 Document Usage

Each section of this document contains a number of font tables. Each table shows a set of symbols, with the corresponding LaTeX command to the right of each symbol. A table's caption indicates what package needs to be loaded in order to access that table's symbols. For example, the symbols in Table 39, "textcomp Old-Style Numerals", are made available by putting "`\usepackage{textcomp}`" in your document's preamble. "$\mathcal{AMS}$" means to use the $\mathcal{AMS}$ packages, viz. amssymb and/or amsmath. Notes below a table provide additional information about some or all the symbols in that table.

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

Section 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 LaTeX ASCII and Latin 1 tables, shows how to input and output Unicode characters, and provides some information about this document itself. The Comprehensive LaTeX Symbol List ends with an index of all the symbols in the document and various additional useful terms.

1.2 Frequently Requested Symbols

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

␣, as in "Spaces␣are␣significant." 9
í, ì, ī, î, etc. (versus í, ì, ī̄, and î) 14
¢ 18
€ 18
©, ®, and ™ 19
‰ 20
∯ 27
∴ 30
:= and ::= 31
≲ and ≳ 38
⋰ 64
°, as in "180°" or "15°C" 67
$\mathscr{L}$, $\mathscr{F}$, etc. 68
$\mathbb{N}$, $\mathbb{Z}$, $\mathbb{R}$, etc. 68
$\mathscr{r}$ 68
ƒ 105
ā́, ȅ, etc. (i.e., several accents per character) 107
<, >, and | (instead of ¡, ¿, and —) 114
ˆ and ˜ (or ∼) 115

2 Body-text symbols

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

Table 1: LaTeX 2ε Escapable "Special" Characters

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

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

Table 2: Predefined LaTeX 2ε Text-mode Commands

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

Where two symbols are present, the left one is the "faked" symbol that LaTeX 2ε 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: LaTeX 2ε Commands Defined to Work in Both Math and Text Mode

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

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

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

✓	`\checkmark`	Ⓡ	`\circledR`	✠	`\maltese`

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

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

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

Table 6: Letters Used to Typeset African Languages

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

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

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

Table 7: Letters Used to Typeset Vietnamese

Ơ	`\OHORN`	ơ	`\ohorn`	Ư	`\UHORN`	ư	`\uhorn`

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

Table 8: Punctuation Marks Not Found in OT1

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

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

Table 9: pifont Decorative Punctuation Marks

❶	`\ding{123}`	❝	`\ding{125}`	❡	`\ding{161}`	❣	`\ding{163}`
❷	`\ding{124}`	❞	`\ding{126}`	❢	`\ding{162}`		

TABLE 10: tipa Phonetic Symbols

ɤ	\textbabygamma	ʔ	\textglotstop	ɳ	\textrtailn
ƀ	\textbarb	ˑ	\texthalflength	ɽ	\textrtailr
ͼ	\textbarc	ъ	\texthardsign	ʂ	\textrtails
đ	\textbard	ʰ	\texthooktop	ʈ	\textrtailt
ɟ	\textbardotlessj	ɓ	\texthtb	ʐ	\textrtailz
ǥ	\textbarg	ʄ	\texthtbardotlessj	˞	\textrthook
ʔ	\textbarglotstop	ͻ	\texthtc	ʌ	\textsca
ɨ	\textbari	ԁ	\texthtd	ʙ	\textscb
ɬ	\textbarl	ԍ	\texthtg	ɛ	\textsce
ɵ	\textbaro	ɦ	\textthh	ɢ	\textscg
ʕ	\textbarrevglotstop	ʃ	\textththeng	ʜ	\textsch
ʉ	\textbaru	ƙ	\texthtk	ə	\textschwa
ɬ	\textbeltl	ƥ	\texthtp	ɪ	\textsci
β	\textbeta	ԛ	\texthtq	ʝ	\textscj
ʘ	\textbullseye	ԕ	\texthtrtaild	ʟ	\textscl
ˊ	\textceltpal	ԍ	\texthtscg	ɴ	\textscn
	\textchi	ƭ	\texthtt	œ	\textscoelig
ɔ	\textcloseepsilon	ʰʊ	\texthvlig	ɷ	\textscomega
ɷ	\textcloseomega	ƽ	\textinvglotstop	ʁ	\textscr
ɞ	\textcloserevepsilon	ʁ	\textinvscr	ɑ	\textscripta
ʒ	\textcommatailz	ɩ	\textiota	ɡ	\textscriptg
˩	\textcorner	ʎ	\textlambda	ʊ	\textscriptv
ƀ	\textcrb	ː	\textlengthmark	ᴜ	\textscu
đ	\textcrd	ɻ	\textlhookt	ʏ	\textscy
ǥ	\textcrg	ɭ	\textlhtlongi	ˌ	\textsecstress
ħ	\textcrh	ʯ	\textlhtlongy	ь	\textsoftsign
ƽ	\textcrinvglotstop	ɾ	\textlonglegr	ʗ	\textstretchc
ƛ	\textcrlambda	˂	\textlptr	ʦ	\texttctclig
ƻ	\textcrtwo	ɱ	\textltailm	ʧ	\textteshlig
ȼ	\textctc	ɲ	\textltailn	θ	\texttheta
ԁ	\textctd	ɬ	\textltilde	þ	\textthorn
ʣ	\textctdctzlig	ɮ	\textlyoghlig	ǀ	\texttoneletterstem
ʃ	\textctesh	ɟ	\textObardotlessj	ʦ	\texttslig
ʝ	\textctj	ɮ	\textOlyoghlig	ʊ	\textturna
ɳ	\textctn	ω	\textomega	ɶ	\textturncelig
ʇ	\textctt	ˠ	\textopencorner	ʯ	\textturnh
ʨ	\textcttctclig	ɔ	\textopeno	ʞ	\textturnk
ʒ	\textctyogh	˒	\textpalhook	ʟ	\textturnlonglegr
ʑ	\textctz	ɸ	\textphi	ɯ	\textturnm
ʤ	\textdctzlig	ǀ	\textpipe	ɯ	\textturnmrleg
ǯ	\textdoublebaresh	ˈ	\textprimstress	ɹ	\textturnr
ǂ	\textdoublebarpipe	ˀ	\textraiseglotstop	ɻ	\textturnrrtail
≠	\textdoublebarslash	ˡ	\textraisevibyi	ɒ	\textturnscripta
‖	\textdoublepipe	ɤ	\textramshorns	ʇ	\textturnt
‖	\textdoublevertline	ʻ	\textrevapostrophe	ʌ	\textturnv
↓	\textdownstep	ɘ	\textreve	ʍ	\textturnw
ʤ	\textdyoghlig	ɜ	\textrevepsilon	ʎ	\textturny
ʤ	\textdzlig	ʕ	\textrevglotstop	ʊ	\textupsilon
ɛ	\textepsilon	ʒ	\textrevyogh	↑	\textupstep

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ʃ	\textesh	ɜ˞	\textrhookrevepsilon	|	\textvertline
ɾ	\textfishhookr	ɚ	\textrhookschwa	ɺ	\textvibyi
g	\textg	˞	\textrhoticity	ʯ	\textvibyy
ɣ	\textgamma	˃	\textrptr	þ	\textwynn
↘	\textglobfall	ɖ	\textrtaild	ȝ	\textyogh
↗	\textglobrise	ɭ	\textrtaill		

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

Table 11: tipx Phonetic Symbols

ɐ	\textaolig	ʃ	\texthtbardotlessjvar	˔	\textrthooklong
ʒ	\textbenttailyogh	ʊ	\textinvomega	ᴐ	\textscaolig
ɣ	\textbktailgamma	ʌ	\textinvsca	ᴀ	\textscdelta
ʕ	\textctinvglotstop	ɑ	\textinvscripta	ꜰ	\textscf
ʝ	\textctjvar	ɬ	\textlfishhookrlig	ᴋ	\textsck
ʗ	\textctstretchc	ɬ	\textlhookfour	ᴍ	\textscm
ʗ	\textctstretchcvar	ɸ	\textlhookp	ᴘ	\textscp
ʞ	\textctturnt	ɪ	\textlhti	ǫ	\textscq
ʤ	\textdblig	ɺ	\textlooptoprevesh	←	\textspleftarrow
ǂ	\textdoublebarpipevar	ɳ	\textnrleg	ʗ	\textstretchcvar
‖	\textdoublepipevar	⊙	\textObullseye	↔	\textsubdoublearrow
↓	\textdownfullarrow	˩	\textpalhooklong	→	\textsubrightarrow
♀	\textfemale	ʲ	\textpalhookvar	ƿ	\textthornvari
ɲ	\textfrbarn	ǀ	\textpipevar	ƿ	\textthornvarii
ɗ	\textfrhookd	ɋ	\textqplig	ƿ	\textthornvariii
ɗ	\textfrhookdvar	▯	\textrectangle	ƿ	\textthornvariv
ʈ	\textfrhookt	↢	\textretractingvar	ƾ	\textturnglotstop
ɣ	\textfrtailgamma	ɹ	\textrevscl	ʞ	\textturnsck
ʔ	\textglotstopvari	ʁ	\textrevscr	∩	\textturnscu
ʔ	\textglotstopvarii	ɑ˞	\textrhooka	ɛ	\textturnthree
ʔ	\textglotstopvariii	ɛ˞	\textrhooke	ƻ	\textturntwo
ɣ	\textgrgamma	ɛ˞	\textrhookepsilon	♀	\textuncrfemale
ɧ	\textheng	ɔ˞	\textrhookopeno	↑	\textupfullarrow
ɱ	\texthmlig	ɳ̢	\textrtailhth		

TABLE 12: wsuipa Phonetic Symbols

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

TABLE 13: wasysym Phonetic Symbols

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

TABLE 14: phonetic Phonetic Symbols

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

Table 15: t4phonet Phonetic Symbols

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

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

Table 16: semtrans Transliteration Symbols

ʾ	\Alif	ʿ	\Ayn

Table 17: Text-mode Accents

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

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

* Requires the textcomp package.

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

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

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

Also note the existence of \i and \j, which produce dotless versions of “i” and “j” (viz., “ı” and “ȷ”). These are useful when the accent is supposed to replace the dot 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 “naïve” 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

Á◌́	`\textacutemacron{A}\textacutemacron{a}`
Á◌́	`\textacutewedge{A}\textacutewedge{a}`
A◌̟	`\textadvancing{A}\textadvancing{a}`
A◌͡◌	`\textbottomtiebar{A}\textbottomtiebar{a}`
Ă◌̆	`\textbrevemacron{A}\textbrevemacron{a}`
Ã◌̃	`\textcircumacute{A}\textcircumacute{a}`
Â◌̂	`\textcircumdot{A}\textcircumdot{a}`
Ǎ◌̌	`\textdotacute{A}\textdotacute{a}`
Ă◌̣	`\textdotbreve{A}\textdotbreve{a}`
À◌̏	`\textdoublegrave{A}\textdoublegrave{a}`
Ä◌̎	`\textdoublevbaraccent{A}\textdoublevbaraccent{a}`
Ȃ◌̂	`\textgravecircum{A}\textgravecircum{a}`
Ȧ◌̀	`\textgravedot{A}\textgravedot{a}`
Ā◌̀	`\textgravemacron{A}\textgravemacron{a}`
Ǎ◌̀	`\textgravemid{A}\textgravemid{a}`
A◌̪	`\textinvsubbridge{A}\textinvsubbridge{a}`
A◌̞	`\textlowering{A}\textlowering{a}`
Ǎ◌́	`\textmidacute{A}\textmidacute{a}`
Ǎ◌̆	`\textovercross{A}\textovercross{a}`
Ă◌̈	`\textoverw{A}\textoverw{a}`
A◌̨	`\textpolhook{A}\textpolhook{a}`
A◌̝	`\textraising{A}\textraising{a}`
A◌̠	`\textretracting{A}\textretracting{a}`
Å◌̊	`\textringmacron{A}\textringmacron{a}`
Â◌̂	`\textroundcap{A}\textroundcap{a}`
A◌̼	`\textseagull{A}\textseagull{a}`
A◌̗	`\textsubacute{A}\textsubacute{a}`
A◌̫	`\textsubarch{A}\textsubarch{a}`
A◌̲	`\textsubbar{A}\textsubbar{a}`
A◌̪	`\textsubbridge{A}\textsubbridge{a}`
A◌̭	`\textsubcircum{A}\textsubcircum{a}`
A◌̣	`\textsubdot{A}\textsubdot{a}`
A◌̗	`\textsubgrave{A}\textsubgrave{a}`
A◌̢	`\textsublhalfring{A}\textsublhalfring{a}`
A◌̟	`\textsubplus{A}\textsubplus{a}`
A◌̜	`\textsubrhalfring{A}\textsubrhalfring{a}`
A◌̥	`\textsubring{A}\textsubring{a}`
A◌̺	`\textsubsquare{A}\textsubsquare{a}`
A◌̰	`\textsubtilde{A}\textsubtilde{a}`
A◌̤	`\textsubumlaut{A}\textsubumlaut{a}`

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A͍a͍	`\textsubw{A}\textsubw{a}`
A͎a͎	`\textsubwedge{A}\textsubwedge{a}`
A~a~	`\textsuperimposetilde{A}\textsuperimposetilde{a}`
Aa᷈	`\textsyllabic{A}\textsyllabic{a}`
Ȧ̃ȧ̃	`\texttildedot{A}\texttildedot{a}`
A͡a͡	`\texttoptiebar{A}\texttoptiebar{a}`
Ȧ̍ȧ̍	`\textvbaraccent{A}\textvbaraccent{a}`

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

Table 19: extraipa Text-mode Accents

A̋a̋	`\bibridge{A}\bibridge{a}`
Áá	`\crtilde{A}\crtilde{a}`
Ȧ̃ȧ̃	`\dottedtilde{A}\dottedtilde{a}`
A̰a̰	`\doubletilde{A}\doubletilde{a}`
A͓a͓	`\finpartvoice{A}\finpartvoice{a}`
A͓̥a͓̥	`\finpartvoiceless{A}\finpartvoiceless{a}`
A͕a͕	`\inipartvoice{A}\inipartvoice{a}`
Å͕å͕	`\inipartvoiceless{A}\inipartvoiceless{a}`
A̋a̋	`\overbridge{A}\overbridge{a}`
A͙a͙	`\partvoice{A}\partvoice{a}`
A͙̥a͙̥	`\partvoiceless{A}\partvoiceless{a}`
A⃗a⃗	`\sliding{A}\sliding{a}`
A↔a↔	`\spreadlips{A}\spreadlips{a}`
A̗a̗	`\subcorner{A}\subcorner{a}`
A̳a̳	`\subdoublebar{A}\subdoublebar{a}`
A̪a̪	`\subdoublevert{A}\subdoublevert{a}`
A̹a̹	`\sublptr{A}\sublptr{a}`
A̺a̺	`\subrptr{A}\subrptr{a}`
A̝a̝	`\whistle{A}\whistle{a}`

Table 20: wsuipa Text-mode Accents

A̪a̪	`\dental{A}\dental{a}`
A̠a̠	`\underarch{A}\underarch{a}`

Table 21: phonetic Text-mode Accents

A̝a̝	`\hill{A}\hill{a}`	A̡a̡	`\rc{A}\rc{a}`	A̰a̰	`\ut{A}\ut{a}`
Ḁḁ	`\od{A}\od{a}`	A̬a̬	`\syl{A}\syl{a}`		
Å̝å̝	`\ohill{A}\ohill{a}`	A̤a̤	`\td{A}\td{a}`		

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

Table 22: metre Text-mode Accents

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

Table 23: t4phonet Text-mode Accents

Ȁȁ	`\textdoublegrave{A}\textdoublegrave{a}`
Ȧȧ	`\textvbaraccent{A}\textvbaraccent{a}`
Ḁḁ	`\textdoublevbaraccent{A}\textdoublevbaraccent{a}`

The idea behind the t4phonet package's text-mode accents is to provide an interface to some of the accents in the T4 font encoding (accents marked with "‡" in Table 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

A͡a	`\overarc{A}\overarc{a}`	A͜a	`\underarc{A}\underarc{a}`

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

Table 25: semtrans Accents

A̤a̤	`\D{A}\D{a}`	A̬a̬	`\U{A}\U{a}`

Ɐɐ	`\T{A}\T{a}`*

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

Table 26: ogonek Accents

Ąą	`\k{A}\k{a}`

Table 27: combelow Accents

A̦a̦	`\cb{A}\cb{a}`

`\cb` places a comma *above* letters with descenders. Hence, while "`\cb{s}`" produces "ș", "`\cb{g}`" produces "ģ".

Table 28: wsuipa Diacritics

ʿ	\ain	˂	\leftp	˚	\overring	ˈ	\stress	ˬ	\underwedge
˥	\corner	ˣ	\leftt	˛	\polishhook	ˌ	\syllabic	˄	\upp
˅	\downp	ː	\length	˃	\rightp	¨	\underdots	⊥	\upt
⊤	\downt	~	\midtilde	⊢	\rightt	̥	\underring		
ˑ	\halflength	˵	\open	ˌ	\secstress	̰	\undertilde		

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

Table 29: textcomp Diacritics

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

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

Table 30: textcomp Currency Symbols

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

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

Table 31: marvosym Currency Symbols

ℛ	\Denarius	€	\EUR	€	\EURdig	€	\EURtm	℔	\Pfund
@	\Ecommerce	€	\EURcr	€	\EURhv	$	\EyesDollar	ℐ	\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 (€), or Garamond (€).

Table 32: wasysym Currency Symbols

¢	\cent	¤	\currency

Table 33: LaTeX 2e Currency Symbols

€	\Euro	₰	\Pound

Table 34: teubner Currency Symbols

⋌	\denarius	ↄ	\hemiobelion	ↄ	\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	©	©	\textcopyright	℠	℠	\textservicemark
ↄ	\textcopyleft	®	®	\textregistered	™	™	\texttrademark

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

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

Table 38: cclicenses Creative Commons License Icons

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

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

Table 39: textcomp Old-style Numerals

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

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

Table 40: Miscellaneous textcomp Symbols

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

Where two symbols are present, the left one is the "faked" symbol that LaTeX 2ε 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 wasysym Text-mode Symbols

‰	\permil

3 Mathematical symbols

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

Alphanumeric symbols (e.g., "$\mathscr{L}$" and "$\mathbb{Z}$") are usually produced using one of the math alphabets in Table 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 "$\lightning$" (`\blitza`), "$\Rightarrow\!\!\Leftarrow$" (`\Rightarrow\Leftarrow`), "$\bot$" (`\bot`), "$\nleftrightarrow$" (`\nleftrightarrow`), and "※" (`\textreferencemark`). Because of the lack of notational consensus, it is probably better to spell out "Contradiction!" than to use a symbol for this purpose. Similarly, discussions on `comp.text.tex` have revealed that there are a variety of ways to indicate the mathematical notion of "is defined as". Common candidates include "$\triangleq$" (`\triangleq`), "$\equiv$" (`\equiv`), "$:=$" (*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 "$\overline{x}$" (`\overline{x}`), by some people as "$\langle x \rangle$" (`\langle x \rangle`), and by some people as "$\diameter x$" 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

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

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

Table 43: cmll Unary Operators

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

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

[1] In txfonts, pxfonts, and mathtools the symbol is called `\coloneqq`. In mathabx and MnSymbol it's called `\coloneq`. In colonequals it's called `\colonequals`.

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

TABLE 44: Binary Operators

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

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

TABLE 45: $\mathcal{AMS}$ Binary Operators

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

* Some people use a superscripted \intercal for matrix transpose: "A^\intercal" ↦ "$A^{\intercal}$". (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: "$A^{\top}$", "A^{T}", "A^{T}".

TABLE 46: stmaryrd Binary Operators

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

Table 47: wasysym Binary Operators

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

Table 48: txfonts/pxfonts Binary Operators

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

Table 49: mathabx Binary Operators

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

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

Table 50: MnSymbol Binary Operators

⨿	\amalg	⩏	\doublesqcup	∵	\righttherefore
∗	\ast	⩔	\doublevee	⋏	\rightthreetimes
⨸	\backslashdiv	⩓	\doublewedge	⊱	\rightY
⋈	\bowtie	∵	\downtherefore	⋊	\rtimes
•	\bullet	⊰	\downY	⨸	\slashdiv
∩	\cap	⧢	\dtimes	∏	\smallprod
⩍	\capdot	⁘	\fivedots	⊓	\sqcap
⨢	\capplus	∞	\hbipropto	⩎	\sqcapdot
·	\cdot	‥	\hdotdot	⨅	\sqcapplus
∘	\circ	⌐	\lefthalfcap	⊔	\sqcup

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⩛	\closedcurlyvee	⌞	\lefthalfcup	⊔	\sqcupdot
⩜	\closedcurlywedge	∵	\leftthereforе	⊎	\sqcupplus
∪	\cup	⋉	\leftthreetimes	::	\squaredots
⊍	\cupdot	⋏	\leftY	×	\times
⊎	\cupplus	⋉	\ltimes	⋰	\udotdot
⋎	\curlyvee	⧹	\medbackslash	∴	\uptherefore
⩟	\curlyveedot	○	\medcircle	⅄	\upY
⋏	\curlywedge	⟋	\medslash	⨰	\utimes
⩞	\curlywedgedot	∣	\medvert	⨂	\vbipropto
⋱	\ddotdot	∣·	\medvertdot	:	\vdotdot
∷	\diamonddots	−	\minus	∨	\vee
÷	\div	∸	\minusdot	⩒	\veedot
·∣	\dotmedvert	∓	\mp	⧓	\vertbowtie
∸	\dotminus	⟃	\neswbipropto	·∣·	\vertdiv
⋒	\doublecap	⟄	\nwsebipropto	∧	\wedge
⋓	\doublecup	+	\plus	⟑	\wedgedot
⩚	\doublecurlyvee	±	\pm	≀	\wreath
⩙	\doublecurlywedge	⌝	\righthalfcap		
⨆	\doublesqcap	⌟	\righthalfcup		

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

Table 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: cmll Binary Operators

⅋	\parr	&	\with*

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

Table 53: shuffle Binary Operators

⧢	\cshuffle	⧢	\shuffle

Table 54: ulsy Geometric Binary Operators

⊜	\odplus

TABLE 55: mathabx Geometric Binary Operators

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

TABLE 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	⧋	\otriangle
⟐	\diamondbackslash	▸	\filledtriangleright	⦶	\overt
⟐	\diamonddiamond	▴	\filledtriangleup	⛤	\pentagram
⟐	\diamonddot	◇	\meddiamond	⋄	\smalldiamond
⟐	\diamondminus	□	\medsquare	▫	\smallsquare
⟐	\diamondplus	☆	\medstar	⭑	\smallstar
⟐	\diamondslash	▽	\medtriangledown	▿	\smalltriangledown
⟐	\diamondtimes	◁	\medtriangleleft	◃	\smalltriangleleft
⟐	\diamondvert	▷	\medtriangleright	▹	\smalltriangleright
▽	\downslice	△	\medtriangleup	▵	\smalltriangleup
◆	\filleddiamond	⊛	\oast	⋆	\thinstar
■	\filledmedsquare	⦸	\obackslash	△	\upslice

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

TABLE 57: Variable-sized Math Operators

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

TABLE 58: $\mathcal{AMS}$ Variable-sized Math Operators

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

TABLE 59: stmaryrd Variable-sized Math Operators

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

TABLE 60: wasysym Variable-sized Math Operators

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

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

* Not defined when wasysym is passed the integrals option.

† Defined only when wasysym is passed the integrals option. Otherwise, the default LaTeX `\int` glyph (as shown in Table 57) is used.

TABLE 61: mathabx Variable-sized Math Operators

$\bigcurlyvee$	`\bigcurlyvee`	$\bigboxslash$	`\bigboxslash`	$\bigoright$	`\bigoright`
$\bigsqcap$	`\bigsqcap`	$\bigboxtimes$	`\bigboxtimes`	$\bigoslash$	`\bigoslash`
$\bigcurlywedge$	`\bigcurlywedge`	$\bigboxtop$	`\bigboxtop`	$\bigotop$	`\bigotop`
$\bigboxasterisk$	`\bigboxasterisk`	$\bigboxtriangleup$	`\bigboxtriangleup`	$\bigotriangleup$	`\bigotriangleup`

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	`\bigboxbackslash`		`\bigboxvoid`		`\bigovoid`
	`\bigboxbot`		`\bigcomplementop`		`\bigplus`
	`\bigboxcirc`		`\bigoasterisk`		`\bigsquplus`
	`\bigboxcoasterisk`		`\bigobackslash`		`\bigtimes`
	`\bigboxdiv`		`\bigobot`		`\iiint`
	`\bigboxdot`		`\bigocirc`		`\iint`
	`\bigboxleft`		`\bigocoasterisk`		`\int`
	`\bigboxminus`		`\bigodiv`		`\oiint`
	`\bigboxplus`		`\bigoleft`		`\oint`
	`\bigboxright`		`\bigominus`		

TABLE 62: txfonts/pxfonts Variable-sized Math Operators

	`\bigsqcapplus`		`\ointclockwise`		
	`\bigsqcupplus`		`\ointctrclockwise`		
	`\fint`		`\sqiiint`		
	`\idotsint`		`\sqiint`		
	`\iiiint`		`\sqint`		
	`\iiint`		`\varoiiintclockwise`		

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$\iint$	$\iint$	`\iint`	$\varoiiintctrclockwise$	$\varoiiintctrclockwise$	`\varoiiintctrclockwise`
$\oiiintclockwise$	$\oiiintclockwise$	`\oiiintclockwise`	$\varoiintclockwise$	$\varoiintclockwise$	`\varoiintclockwise`
$\oiiintctrclockwise$	$\oiiintctrclockwise$	`\oiiintctrclockwise`	$\varoiintctrclockwise$	$\varoiintctrclockwise$	`\varoiintctrclockwise`
$\oiiint$	$\oiiint$	`\oiiint`	$\varointclockwise$	$\varointclockwise$	`\varointclockwise`
$\oiintclockwise$	$\oiintclockwise$	`\oiintclockwise`	$\varointctrclockwise$	$\varointctrclockwise$	`\varointctrclockwise`
$\oiintctrclockwise$	$\oiintctrclockwise$	`\oiintctrclockwise`	$\varprod$	$\varprod$	`\varprod`
$\oiint$	$\oiint$	`\oiint`			

TABLE 63: esint Variable-sized Math Operators

$\dotsint$	$\dotsint$	`\dotsint`	$\ointclockwise$	$\ointclockwise$	`\ointclockwise`
$\fint$	$\fint$	`\fint`	$\ointctrclockwise$	$\ointctrclockwise$	`\ointctrclockwise`
$\iiiint$	$\iiiint$	`\iiiint`	$\sqiint$	$\sqiint$	`\sqiint`
$\iiint$	$\iiint$	`\iiint`	$\sqint$	$\sqint$	`\sqint`
$\iint$	$\iint$	`\iint`	$\varoiint$	$\varoiint$	`\varoiint`
$\landdownint$	$\landdownint$	`\landdownint`	$\varointclockwise$	$\varointclockwise$	`\varointclockwise`
$\landupint$	$\landupint$	`\landupint`	$\varointctrclockwise$	$\varointctrclockwise$	`\varointctrclockwise`
$\oiint$	$\oiint$	`\oiint`			

TABLE 64: MnSymbol Variable-sized Math Operators

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

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

TABLE 65: mathdesign Variable-sized Math Operators

$\intclockwise$		\intclockwise	$\ointclockwise$		\ointclockwise
$\oiiint$		\oiiint	$\ointctrclockwise$		\ointctrclockwise
$\oiint$		\oiint			

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

TABLE 66: cmll Large Math Operators

$\bigparr$	\bigparr	$\bigwith$	\bigwith

TABLE 67: Binary Relations

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

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

† The difference between \mid and | is that the former is a binary relation while the latter is a math ordinal. Consequently, LaTeX typesets the two with different surrounding spacing. Contrast "P(A | B)" ↦ "$P(A|B)$" with "P(A \mid B)" ↦ "$P(A \mid B)$".

TABLE 68: $\mathcal{AMS}$ Binary Relations

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

Table 69: $\mathcal{AMS}$ Negated Binary Relations

$\ncong$	\ncong	$\nshortparallel$	\nshortparallel	$\nVDash$	\nVDash
$\nmid$	\nmid	$\nsim$	\nsim	$\precnapprox$	\precnapprox
$\nparallel$	\nparallel	$\nsucc$	\nsucc	$\precnsim$	\precnsim
$\nprec$	\nprec	$\nsucceq$	\nsucceq	$\succnapprox$	\succnapprox
$\npreceq$	\npreceq	$\nvDash$	\nvDash	$\succnsim$	\succnsim
$\nshortmid$	\nshortmid	$\nvdash$	\nvdash		

Table 70: stmaryrd Binary Relations

$\inplus$	\inplus	$\niplus$	\niplus

Table 71: wasysym Binary Relations

$\invneg$	\invneg	$\leadsto$	\leadsto	$\wasypropto$	\wasypropto
$\Join$	\Join	$\logof$	\logof		

Table 72: txfonts/pxfonts Binary Relations

$\circledgtr$	\circledgtr	$\lJoin$	\lJoin	$\opentimes$	\opentimes
$\circledless$	\circledless	$\lrtimes$	\lrtimes	$\Perp$	\Perp
$:\approx$	\colonapprox	$\multimap$	\multimap	$\preceqq$	\preceqq
$::\approx$	\Colonapprox	$\multimapboth$	\multimapboth	$\precneqq$	\precneqq
$:-$	\coloneq	$\multimapbothvert$	\multimapbothvert	$\rJoin$	\rJoin
$::-$	\Coloneq	$\multimapdot$	\multimapdot	$\strictfi$	\strictfi
$::=$	\Coloneqq	$\multimapdotboth$	\multimapdotboth	$\strictif$	\strictif
$:=$	\coloneqq*	$\multimapdotbothA$	\multimapdotbothA	$\strictiff$	\strictiff
$::\sim$	\Colonsim	$\multimapdotbothAvert$	\multimapdotbothAvert	$\succeqq$	\succeqq
$:\sim$	\colonsim	$\multimapdotbothB$	\multimapdotbothB	$\succneqq$	\succneqq
$-::$	\Eqcolon	$\multimapdotbothBvert$	\multimapdotbothBvert	$\varparallel$	\varparallel
$-:$	\eqcolon	$\multimapdotbothvert$	\multimapdotbothvert	$\varparallelinv$	\varparallelinv
$=:$	\eqqcolon	$\multimapdotinv$	\multimapdotinv	$\VvDash$	\VvDash
$=::$	\Eqqcolon	$\multimapinv$	\multimapinv		
$\eqsim$	\eqsim	$\openJoin$	\openJoin		

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

Table 73: txfonts/pxfonts Negated Binary Relations

$\napproxeq$	\napproxeq	$\npreccurlyeq$	\npreccurlyeq	$\nthickapprox$	\nthickapprox
$\nasymp$	\nasymp	$\npreceqq$	\npreceqq	$\ntwoheadleftarrow$	\ntwoheadleftarrow
$\nbacksim$	\nbacksim	$\nprecsim$	\nprecsim	$\ntwoheadrightarrow$	\ntwoheadrightarrow
$\nbacksimeq$	\nbacksimeq	$\nsimeq$	\nsimeq	$\nvarparallel$	\nvarparallel
$\nbumpeq$	\nbumpeq	$\nsuccapprox$	\nsuccapprox	$\nvarparallelinv$	\nvarparallelinv
$\nBumpeq$	\nBumpeq	$\nsucccurlyeq$	\nsucccurlyeq	$\nVdash$	\nVdash
$\nequiv$	\nequiv	$\nsucceqq$	\nsucceqq		
$\nprecapprox$	\nprecapprox	$\nsuccsim$	\nsuccsim		

TABLE 74: mathabx Binary Relations

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

TABLE 75: mathabx Negated Binary Relations

≉	\napprox	⊥	\notperp	⊭	\nvDash
≇	\ncong	⊀	\nprec	⊯	\nVDash
⋜	\ncurlyeqprec	≾	\nprecapprox	⊮	\nVdash
⋝	\ncurlyeqsucc	⋠	\npreccurlyeq	⊬	\nvdash
⊯	\nDashv	⋠	\npreceq	⊮	\nVvash
⊮	\ndashV	≾	\nprecsim	≾	\precnapprox
⊬	\ndashv	⊁	\nsim	⪵	\precneq
⊯	\nDashV	≄	\nsimeq	≾	\precnsim
⊮	\ndashVv	⊁	\nsucc	≿	\succnapprox
≠	\neq	≿	\nsuccapprox	⪶	\succneq
≁	\notasymp	⋡	\nsucccurlyeq	≿	\succnsim
∤	\notdivides	⋡	\nsucceq		
≢	\notequiv	≿	\nsuccsim		

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

TABLE 76: MnSymbol Binary Relations

≈	\approx	≒	\eqbump	↖	\nwfootline	⫛	\seVdash
≊	\approxeq	≖	\eqcirc	↖	\nwfree	∥	\shortparallel
≲	\backapprox	≒	\eqdot	↘	\nwmodels	∼	\sim
⋧	\backapproxeq	≃	\eqsim	⇘	\nwModels	≃	\simeq
≌	\backcong	=	\equal	↛	\nwsecrossing	≻	\succ
⋍	\backeqsim	⊜	\equalclosed	↘	\nwseline	≿	\succapprox
∽	\backsim	≡	\equiv	⇘	\Nwseline	⩾	\succcurlyeq
⋍	\backsimeq	⊟	\equivclosed	↘	\nwvdash	≥	\succeq
≋	\backtriplesim	≒	\fallingdotseq	⇘	\nwVdash	≿	\succsim
≬	\between	≙	\hateq	≺	\prec	↙	\swfootline

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≏	\bumpeq	≍	\hcrossing	⪷	\precapprox	↙	\swfree
≎	\Bumpeq	⊢	\leftfootline	≼	\preccurlyeq	⇗	\swmodels
≗	\circeq	←	\leftfree	⪯	\preceq	⇗	\swModels
⧈	\closedequal	⫤	\leftmodels	≾	\precsim	↗	\swvdash
⊰	\closedprec	⫤	\leftModels	⊣	\rightfootline	⇗	\swVdash
⊱	\closedsucc	∝	\leftpropto	→	\rightfree	≋	\triplesim
≔	\coloneq	—	\leftrightline	⊨	\rightmodels	|	\updownline
≅	\cong	═	\Leftrightline	⫦	\rightModels	‖	\Updownline
⋞	\curlyeqprec	◁	\leftslice	∞	\rightpropto	⊺	\upfootline
⋟	\curlyeqsucc	⊣	\leftvdash	▷	\rightslice	↑	\upfree
≐	\doteq	⫣	\leftVdash	⊢	\rightvdash	⫫	\upmodels
≑	\Doteq	↗	\nefootline	⫧	\rightVdash	⫫	\upModels
⎣	\downfootline	↗	\nefree	≓	\risingdotseq	∝	\uppropto
↓	\downfree	⫽	\nemodels	↘	\sefootline	⊥	\upvdash
⫪	\downmodels	⫽	\neModels	↘	\sefree	⫠	\upVdash
⫫	\downModels	⁄	\neswline	⪦	\semodels	⨯	\vcrossing
∝	\downpropto	⫻	\Neswline	⪦	\seModels	⊪	\Vvdash
⊤	\downvdash	↙	\nevdash	)(	\separated		
⫟	\downVdash	⫽	\neVdash	⪡	\sevdash		

MnSymbol additionally defines synonyms for some of the preceding symbols:

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

TABLE 77: MnSymbol Negated Binary Relations

≉	\napprox	≄	\neqsim	⋙̸	\nnwModels	⊁	\nsucc
≱	\napproxeq	≠	\nequal	⊀	\nnwseline	⪸̸	\nsuccapprox
≴	\nbackapprox	∉	\nequalclosed	⋘̸	\nNwseline	⋡	\nsucccurlyeq
≴	\nbackapproxeq	≢	\nequiv	⊬	\nnwvdash	≱	\nsucceq
≌	\nbackcong	∉	\nequivclosed	⊯	\nnwVdash	≵	\nsuccsim
≁	\nbackeqsim	⊀	\neswcrossing	⊀	\nprec	⋩	\nswfootline
∽̸	\nbacksim	≒	\nfallingdotseq	⪹̸	\nprecapprox	⋩	\nswfree

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$\nbacksimeq$	`\nbacksimeq`	$\nhateq$	`\nhateq`	$\npreccurlyeq$	`\nprecurlyeq`	$\nswmodels$	`\nswmodels`
$\nbacktriplesim$	`\nbacktriplesim`	$\nleftfootline$	`\nleftfootline`	$\npreceq$	`\npreceq`	$\nswModels$	`\nswModels`
$\nbumpeq$	`\nbumpeq`	$\nleftfree$	`\nleftfree`	$\nprecsim$	`\nprecsim`	$\nswvdash$	`\nswvdash`
$\nBumpeq$	`\nBumpeq`	$\nleftmodels$	`\nleftmodels`	$\nrightfootline$	`\nrightfootline`	$\nswVdash$	`\nswVdash`
$\ncirceq$	`\ncirceq`	$\nleftModels$	`\nleftModels`	$\nrightfree$	`\nrightfree`	$\ntriplesim$	`\ntriplesim`
$\nclosedequal$	`\nclosedequal`	$\nleftrightline$	`\nleftrightline`	$\nrightmodels$	`\nrightmodels`	$\nupdownline$	`\nupdownline`
$\ncong$	`\ncong`	$\nLeftrightline$	`\nLeftrightline`	$\nrightModels$	`\nrightModels`	$\nUpdownline$	`\nUpdownline`
$\ncurlyeqprec$	`\ncurlyeqprec`	$\nleftvdash$	`\nleftvdash`	$\nrightvdash$	`\nrightvdash`	$\nupfootline$	`\nupfootline`
$\ncurlyeqsucc$	`\ncurlyeqsucc`	$\nleftVdash$	`\nleftVdash`	$\nrightVdash$	`\nrightVdash`	$\nupfree$	`\nupfree`
$\ndoteq$	`\ndoteq`	$\nnefootline$	`\nnefootline`	$\nrisingdotseq$	`\nrisingdotseq`	$\nupmodels$	`\nupmodels`
$\nDoteq$	`\nDoteq`	$\nnefree$	`\nnefree`	$\nsefootline$	`\nsefootline`	$\nupModels$	`\nupModels`
$\ndownfootline$	`\ndownfootline`	$\nnemodels$	`\nnemodels`	$\nsefree$	`\nsefree`	$\nupvdash$	`\nupvdash`
$\ndownfree$	`\ndownfree`	$\nneModels$	`\nneModels`	$\nsemodels$	`\nsemodels`	$\nupVdash$	`\nupVdash`
$\ndownmodels$	`\ndownmodels`	$\nneswline$	`\nneswline`	$\nseModels$	`\nseModels`	$\precnapprox$	`\precnapprox`
$\ndownModels$	`\ndownModels`	$\nNeswline$	`\nNeswline`	$\nsevdash$	`\nsevdash`	$\precnsim$	`\precnsim`
$\ndownvdash$	`\ndownvdash`	$\nnevdash$	`\nnevdash`	$\nseVdash$	`\nseVdash`	$\succnapprox$	`\succnapprox`
$\ndownVdash$	`\ndownVdash`	$\nneVdash$	`\nneVdash`	$\nshortmid$	`\nshortmid`	$\succnsim$	`\succnsim`
$\neqbump$	`\neqbump`	$\nnwfootline$	`\nnwfootline`	$\nshortparallel$	`\nshortparallel`		
$\neqcirc$	`\neqcirc`	$\nnwfree$	`\nnwfree`	$\nsim$	`\nsim`		
$\neqdot$	`\neqdot`	$\nnwmodels$	`\nnwmodels`	$\nsimeq$	`\nsimeq`		

MnSymbol additionally defines synonyms for some of the preceding symbols:

$\ndashv$	`\ndashv`	(same as `\nleftvdash`)
$\ndiagdown$	`\ndiagdown`	(same as `\nnwseline`)
$\ndiagup$	`\ndiagup`	(same as `\nneswline`)
$\ndivides$	`\ndivides`	(same as `\nupdownline`)
$\ne$	`\ne`	(same as `\nequal`)
$\neq$	`\neq`	(same as `\nequal`)
$\nmid$	`\nmid`	(same as `\nupdownline`)
$\nmodels$	`\nmodels`	(same as `\nrightmodels`)
$\nparallel$	`\nparallel`	(same as `\nUpdownline`)
$\nperp$	`\nperp`	(same as `\nupvdash`)
$\nrelbar$	`\nrelbar`	(same as `\nleftrightline`)
$\nRelbar$	`\nRelbar`	(same as `\nLeftrightline`)
$\nvDash$	`\nvDash`	(same as `\nrightmodels`)
$\nvdash$	`\nvdash`	(same as `\nrightvdash`)
$\nVdash$	`\nVdash`	(same as `\nrightVdash`)
$\nVDash$	`\nVDash`	(same as `\nrightModels`)

Table 78: mathtools Binary Relations

$::\approx$	`\Colonapprox`	$:-$	`\coloneq`	$-::$	`\Eqcolon`
$:\approx$	`\colonapprox`	$:\sim$	`\colonsim`	$=:$	`\eqqcolon`
$:=$	`\coloneqq`	$::\sim$	`\Colonsim`	$=::$	`\Eqqcolon`
$::=$	`\Coloneqq`	$::$	`\dblcolon`		
$::-$	`\Coloneq`	$-:$	`\eqcolon`		

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

$$\underset{\text{“=:=”}}{=:=} \quad \text{vs.} \quad \underset{\text{“=\textbackslash vcentcolon=”}}{=:=}$$

TABLE 79: turnstile Binary Relations

	\dddtstile{abc}{def}		\nntstile{abc}{def}		\stdtstile{abc}{def}
	\ddststile{abc}{def}		\nnttstile{abc}{def}		\stststile{abc}{def}
	\ddtstile{abc}{def}		\nsdtstile{abc}{def}		\sttstile{abc}{def}
	\ddttstile{abc}{def}		\nsststile{abc}{def}		\stttstile{abc}{def}
	\dndtstile{abc}{def}		\nststile{abc}{def}		\tddtstile{abc}{def}
	\dnststile{abc}{def}		\nsttstile{abc}{def}		\tdststile{abc}{def}
	\dntstile{abc}{def}		\ntdtstile{abc}{def}		\tdtstile{abc}{def}
	\dnttstile{abc}{def}		\ntststile{abc}{def}		\tdttstile{abc}{def}
	\dsdtstile{abc}{def}		\nttstile{abc}{def}		\tndtstile{abc}{def}
	\dsststile{abc}{def}		\ntttstile{abc}{def}		\tnststile{abc}{def}
	\dststile{abc}{def}		\sddtstile{abc}{def}		\tntstile{abc}{def}
	\dsttstile{abc}{def}		\sdststile{abc}{def}		\tnttstile{abc}{def}
	\dtdtstile{abc}{def}		\sdtstile{abc}{def}		\tsdtstile{abc}{def}
	\dtststile{abc}{def}		\sdttstile{abc}{def}		\tsststile{abc}{def}
	\dttstile{abc}{def}		\sndtstile{abc}{def}		\tststile{abc}{def}
	\dtttstile{abc}{def}		\snststile{abc}{def}		\tsttstile{abc}{def}
	\nddtstile{abc}{def}		\sntstile{abc}{def}		\ttdtstile{abc}{def}
	\ndststile{abc}{def}		\snttstile{abc}{def}		\ttststile{abc}{def}
	\ndtstile{abc}{def}		\ssdtstile{abc}{def}		\tttstile{abc}{def}
	\ndttstile{abc}{def}		\sssttstile{abc}{def}		\ttttstile{abc}{def}
	\nndtstile{abc}{def}		\sststile{abc}{def}		
	\nnststile{abc}{def}		\ssttstile{abc}{def}		

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

TABLE 80: trsym Binary Relations

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

TABLE 81: trfsigns Binary Relations

⟃	\dfourier	⟄	\Dfourier
⟈	\fourier	⟇	\Fourier
⧾	\laplace	⧿	\Laplace
⨟	\ztransf	⨠	\Ztransf

TABLE 82: cmll Binary Relations

⌔	\coh	⌒	\scoh
≍	\incoh	⌣	\sincoh

TABLE 83: colonequals Binary Relations

≈:	\approxcolon	::−	\coloncolonminus	=::	\equalscoloncolon
≈::	\approxcoloncolon	::∼	\coloncolonsim	−:	\minuscolon
:≈	\colonapprox	:=	\colonequals	−::	\minuscoloncolon
::	\coloncolon	:−	\colonminus	:	\ratio
::≈	\coloncolonapprox	:∼	\colonsim	∼:	\simcolon
::=	\coloncolonequals	=:	\equalscolon	∼::	\simcoloncolon

TABLE 84: fourier Binary Relations

⫻	\nparallelslant	⫽	\parallelslant

TABLE 85: Subset and Superset Relations

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

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

TABLE 86: $\mathcal{AMS}$ Subset and Superset Relations

⊈	\nsubseteq	⫅	\subseteqq	⫆	\supsetneqq
⊉	\nsupseteq	⫋	\subsetneq	⫌	\varsubsetneq
⫋	\nsupseteqq	⫋	\subsetneqq	⫌	\varsubsetneqq
⊏	\sqsubset	⫗	\Supset	⫌	\varsupsetneq
⊐	\sqsupset	⫆	\supseteqq	⫌	\varsupsetneqq
⋐	\Subset	⊋	\supsetneq		

TABLE 87: stmaryrd Subset and Superset Relations

⫋	\subsetplus	⫌	\supsetplus
⫅	\subsetpluseq	⫆	\supsetpluseq

TABLE 88: wasysym Subset and Superset Relations

⊏	\sqsubset	⊐	\sqsupset

TABLE 89: txfonts/pxfonts Subset and Superset Relations

⋢	\nsqsubset	⋣	\nsqsupseteq	⫐	\nSupset
⋤	\nsqsubseteq	⫋	\nSubset		
⋣	\nsqsupset	⫌	\nsubseteqq		

TABLE 90: mathabx Subset and Superset Relations

⋢	\nsqsubset	⊅	\nsupset	⊒	\sqsupseteq	⊇	\supseteq
⋤	\nsqSubset	⫐	\nSupset	⫒	\sqsupseteqq	⫆	\supseteqq
⋣	\nsqsubseteq	⊉	\nsupseteq	⊐	\sqsupsetneq	⊋	\supsetneq
⋥	\nsqsubseteqq	⫉	\nsupseteqq	⫐	\sqsupsetneqq	⫌	\supsetneqq
⋣	\nsqsupset	⊏	\sqsubset	⊂	\subset	⫋	\varsqsubsetneq
⋤	\nsqSupset	⊑	\sqSubset	⋐	\Subset	⫋	\varsqsubsetneqq
⋣	\nsqsupseteq	⊑	\sqsubseteq	⊆	\subseteq	⫌	\varsqsupsetneq
⋥	\nsqsupseteqq	⫑	\sqsubseteqq	⫅	\subseteqq	⫌	\varsqsupsetneqq
⊄	\nsubset	⫋	\sqsubsetneq	⫋	\subsetneq	⫋	\varsubsetneq
⋐	\nSubset	⫋	\sqsubsetneqq	⫋	\subsetneqq	⫋	\varsubsetneqq
⊈	\nsubseteq	⫆	\sqSupset	⊃	\supset	⫌	\varsupsetneq
⫅	\nsubseteqq	⊐	\sqsupset	⫐	\Supset	⫌	\varsupsetneqq

TABLE 91: MnSymbol Subset and Superset Relations

⫋	\nSqsubset	⫋	\nsubseteq	⫋	\sqsubsetneq	⫅	\subseteq
⫋	\nsqsubset	⫋	\nsubseteqq	⫋	\sqsubsetneqq	⫅	\subseteqq
⫋	\nsqsubseteq	⫐	\nSupset	⫆	\Sqsupset	⫋	\subsetneq
⫋	\nsqsubseteqq	⫋	\nsupset	⫐	\sqsupset	⫋	\subsetneqq
⫆	\nSqsupset	⫋	\nsupseteq	⫑	\sqsupseteq	⫐	\Supset
⫋	\nsqsupset	⫋	\nsupseteqq	⫒	\sqsupseteqq	⫐	\supset
⫋	\nsqsupseteq	⫋	\Sqsubset	⫋	\sqsupsetneq	⫆	\supseteq
⫋	\nsqsupseteqq	⫋	\sqsubset	⫋	\sqsupsetneqq	⫆	\supseteqq
⫋	\nSubset	⫑	\sqsubseteq	⫋	\Subset	⫋	\supsetneq
⫋	\nsubset	⫒	\sqsubseteqq	⫋	\subset	⫋	\supsetneqq

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

TABLE 92: Inequalities

≥	\geq	≫	\gg	≤	\leq	≪	\ll	≠	\neq

TABLE 93: $\mathcal{AMS}$ Inequalities

$\geqslant$	`\eqslantgtr`	$\gtrdot$	`\gtrdot`	$\lesseqgtr$	`\lesseqgtr`	$\ngeq$	`\ngeq`
$\leqslant$	`\eqslantless`	$\gtreqless$	`\gtreqless`	$\lesseqqgtr$	`\lesseqqgtr`	$\ngeqq$	`\ngeqq`
$\geqq$	`\geqq`	$\gtreqqless$	`\gtreqqless`	$\lessgtr$	`\lessgtr`	$\ngeqslant$	`\ngeqslant`
$\geqslant$	`\geqslant`	$\gtrless$	`\gtrless`	$\lesssim$	`\lesssim`	$\ngtr$	`\ngtr`
$\ggg$	`\ggg`	$\gtrsim$	`\gtrsim`	$\lll$	`\lll`	$\nleq$	`\nleq`
$\gnapprox$	`\gnapprox`	$\gvertneqq$	`\gvertneqq`	$\lnapprox$	`\lnapprox`	$\nleqq$	`\nleqq`
$\gneq$	`\gneq`	$\leqq$	`\leqq`	$\lneq$	`\lneq`	$\nleqslant$	`\nleqslant`
$\gneqq$	`\gneqq`	$\leqslant$	`\leqslant`	$\lneqq$	`\lneqq`	$\nless$	`\nless`
$\gnsim$	`\gnsim`	$\lessapprox$	`\lessapprox`	$\lnsim$	`\lnsim`		
$\gtrapprox$	`\gtrapprox`	$\lessdot$	`\lessdot`	$\lvertneqq$	`\lvertneqq`		

TABLE 94: wasysym Inequalities

$\succsim$	`\apprge`	$\precsim$	`\apprle`

TABLE 95: txfonts/pxfonts Inequalities

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

TABLE 96: mathabx Inequalities

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

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

TABLE 97: MnSymbol Inequalities

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

MnSymbol additionally defines synonyms for some of the preceding symbols:

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

TABLE 98: $\mathcal{AMS}$ Triangle Relations

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

TABLE 99: stmaryrd Triangle Relations

⩤	\trianglelefteqslant	⩥	\trianglerighteqslant
⪤	\ntrianglelefteqslant	⪥	\ntrianglerighteqslant

TABLE 100: mathabx Triangle Relations

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

TABLE 101: MnSymbol Triangle Relations

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

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

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

TABLE 102: Arrows

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

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

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

TABLE 103: Harpoons

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

TABLE 104: textcomp Text-mode Arrows

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

TABLE 105: $\mathcal{AMS}$ Arrows

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

TABLE 106: $\mathcal{AMS}$ Negated Arrows

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

TABLE 107: $\mathcal{AMS}$ Harpoons

$\downharpoonleft$	\downharpoonleft	$\leftrightharpoons$	\leftrightharpoons	$\upharpoonleft$	\upharpoonleft
$\downharpoonright$	\downharpoonright	$\rightleftharpoons$	\rightleftharpoons	$\upharpoonright$	\upharpoonright

Table 108: stmaryrd Arrows

⇽	\leftarrowtriangle	⤇	\Mapsfrom	←	\shortleftarrow
⥂	\leftrightarroweq	↤	\mapsfrom	→	\shortrightarrow
⇿	\leftrightarrowtriangle	⤅	\Mapsto	↑	\shortuparrow
↯	\lightning	↗	\nnearrow	↘	\ssearrow
⟸	\Longmapsfrom	↖	\nnwarrow	↙	\sswarrow
⟻	\longmapsfrom	⇾	\rightarrowtriangle		
⟾	\Longmapsto	↓	\shortdownarrow		

Table 109: txfonts/pxfonts Arrows

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

Table 110: mathabx Arrows

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

Table 111: mathabx Negated Arrows

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

Table 112: mathabx Harpoons

⥍	\barleftharpoon	↼	\leftharpoonup	⥋	\rightleftharpoons
⥏	\barrightharpoon	⇇	\leftleftharpoons	⇉	\rightrightharpoons
⥥	\downdownharpoons	⇀	\leftrightharpoon	⥮	\updownharpoons
⥗	\downharpoonleft	⇋	\leftrightharpoons	↿	\upharpoonleft
⥖	\downharpoonright	⥤	\rightbarharpoon	↾	\upharpoonright
⥯	\downupharpoons	⇁	\rightharpoondown	⥣	\upupharpoons
⥎	\leftbarharpoon	⇀	\rightharpoonup		
↽	\leftharpoondown	⇄	\rightleftharpoon		

Table 113: MnSymbol Arrows

⤵	\curvearrowdownup	⟵	\longleftarrow	↙	\rhookswarrow
⇜	\curvearrowleftright	⟸	\Longleftarrow	↾	\rhookuparrow
↶	\curvearrownesw	⟷	\longleftrightarrow	→	\rightarrow
↷	\curvearrownwse	⟺	\Longleftrightarrow	⇒	\Rightarrow
⇝	\curvearrowrightleft	⟼	\longmapsto	↣	\rightarrowtail
↶	\curvearrowsenw	⟶	\longrightarrow	⇄	\rightleftarrows
↷	\curvearrowswne	⟹	\Longrightarrow	⇝	\rightlsquigarrow
⥀	\curvearrowupdown	↫	\looparrowleft	↦	\rightmapsto
⇣	\dasheddownarrow	↬	\looparrowright	⇉	\rightrightarrows
⇠	\dashedleftarrow	↰	\Lsh	⇝	\rightrsquigarrow
⇗	\dashednearrow	↗	\nearrow	⇛	\Rrightarrow
⇖	\dashednwarrow	⇗	\Nearrow	↱	\Rsh
⇢	\dashedrightarrow	↗	\nearrowtail	↘	\searrow
⇘	\dashedsearrow	↗	\nelsquigarrow	⇘	\Searrow
⇙	\dashedswarrow	⤢	\nemapsto	↘	\searrowtail
⇡	\dasheduparrow	⇗	\nenearrows	↝	\selsquigarrow
⇓	\Downarrow	↗	\nersquigarrow	↘	\semapsto
↓	\downarrow	⤢	\neswarrow	⇘	\senwarrows
↡	\downarrowtail	⇗	\Neswarrow	↘	\sersquigarrow
⇊	\downdownarrows	⤢	\neswarrows	⇘	\sesearrows
⇂	\downlsquigarrow	↖	\nwarrow	↘	\squigarrowdownup
↧	\downmapsto	⇖	\Nwarrow	↭	\squigarrowleftright
⇂	\downrsquigarrow	↖	\nwarrowtail	⇗	\squigarrownesw
⇵	\downuparrows	↖	\nwlsquigarrow	⇕	\squigarrownwse
◌	\lcirclearrowdown	↖	\nwmapsto	⇗	\squigarrowrightleft
◌	\lcirclearrowleft	⇖	\nwnwarrows	↖	\squigarrowsenw
◌	\lcirclearrowright	↖	\nwrsquigarrow	⇗	\squigarrowswne
◌	\lcirclearrowup	↘	\nwsearrow	⇕	\squigarrowupdown
⤵	\lcurvearrowdown	⇘	\Nwsearrow	↙	\swarrow
↜	\lcurvearrowleft	⇘	\nwsearrows	⇙	\Swarrow
↷	\lcurvearrowne	⟲	\partialvardlcircleleftint*	↙	\swarrowtail
↶	\lcurvearrownw	⟳	\partialvardlcirclerightint*	↙	\swlsquigarrow
⇝	\lcurvearrowright	⟲	\partialvardrcircleleftint*	↙	\swmapsto
↘	\lcurvearrowse	⟳	\partialvardrcirclerightint*	⇙	\swnearrows
↙	\lcurvearrowsw	○	\partialvartlcircleleftint*	↙	\swrsquigarrow
↾	\lcurvearrowup	○	\partialvartlcirclerightint*	⇙	\swswarrows
⇐	\Leftarrow	○	\partialvartrcircleleftint*	↓	\twoheaddownarrow

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←	\leftarrow	⨔	\partialvartrcirclerightint*	↞	\twoheadleftarrow
↢	\leftarrowtail	↻	\rcirclearrowdown	↗	\twoheadnearrow
⇇	\leftleftarrows	↺	\rcirclearrowleft	↖	\twoheadnwarrow
⇜	\leftlsquigarrow	↻	\rcirclearrowright	↠	\twoheadrightarrow
↤	\leftmapsto	↺	\rcirclearrowup	↘	\twoheadsearrow
↔	\leftrightarrow	↷	\rcurvearrowdown	↙	\twoheadswarrow
⇔	\Leftrightarrow	↶	\rcurvearrowleft	↟	\twoheaduparrow
⇆	\leftrightarrows	↱	\rcurvearrowne	↑	\uparrow
↜	\leftrsquigarrow	↰	\rcurvearrownw	⇑	\Uparrow
⇃	\lhookdownarrow	↴	\rcurvearrowright	↥	\uparrowtail
↼	\lhookleftarrow	↳	\rcurvearrowse	↕	\updownarrow
↗	\lhooknearrow	↶	\rcurvearrowsw	⇕	\Updownarrow
↖	\lhooknwarrow	↰	\rcurvearrowup	⇅	\updownarrows
↪	\lhookrightarrow	↧	\rhookdownarrow	↿	\uplsquigarrow
↘	\lhooksearrow	↩	\rhookleftarrow	↥	\upmapsto
↙	\lhookswarrow	↗	\rhooknearrow	↾	\uprsquigarrow
↥	\lhookuparrow	↖	\rhooknwarrow	↑↑	\upuparrows
↯	\lightning	↣	\rhookrightarrow		
⇐	\Lleftarrow	↘	\rhooksearrow		

MnSymbol additionally defines synonyms for some of the preceding symbols:

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

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

TABLE 114: MnSymbol Negated Arrows

⤈	\ncurvearrowdownup	↮	\nlhooknwarrow	⇄	\nrightleftarrows
↭	\ncurvearrowleftright	↮	\nlhookrightarrow	⇝	\nrightlsquigarrow
⤢	\ncurvearrownesw	↮	\nlhooksearrow	↦	\nrightmapsto
⤡	\ncurvearrownwse	↚	\nlhookswarrow	⇉	\nrightrightarrows
⤧	\ncurvearrowrightleft	↕	\nlhookuparrow	↛	\nrightrsquigarrow
⤣	\ncurvearrowsenw	⇍	\nLleftarrow	⇏	\nRrightarrow
⤢	\ncurvearrowswne	↗	\nnearrow	↮	\nSearrow
⤨	\ncurvearrowupdown	↗	\nNearrow	↘	\nsearrow

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⇣	\ndasheddownarrow	⇗	\nnearrowtail	⇘	\nsearrowtail
⇠	\ndashedleftarrow	⇗	\nnelsquigarrow	⇘	\nselsquigarrow
⇗	\ndashednearrow	⇗	\nnemapsto	⇘	\nsemapsto
⇖	\ndashednwarrow	⇗	\nnenearrows	⇘	\nsenwarrows
⇢	\ndashedrightarrow	⇗	\nnersquigarrow	⇘	\nsersquigarrow
⇘	\ndashedsearrow	⇗	\nNeswarrow	⇘	\nsesearrows
⇙	\ndashedswarrow	⇙	\nneswarrow	⇘	\nsquigarrowdownup
⇡	\ndasheduparrow	⇙	\nneswarrows	⇝	\nsquigarrowleftright
↓	\ndownarrow	⇖	\nNwarrow	⇝	\nsquigarrownesw
⇓	\nDownarrow	⇖	\nnwarrow	⇕	\nsquigarrownwse
↣	\ndownarrowtail	⇖	\nnwarrowtail	⇗	\nsquigarrowrightleft
⇊	\ndowndownarrows	⇖	\nnwlsquigarrow	⇖	\nsquigarrowsenw
⇂	\ndownlsquigarrow	⇖	\nnwmapsto	⇗	\nsquigarrowswne
↧	\ndownmapsto	⇖	\nnwnwarrows	⇕	\nsquigarrowupdown
⇂	\ndownrsquigarrow	⇖	\nnwrsquigarrow	⇙	\nswarrow
⇵	\ndownuparrows	⇘	\nnwsearrow	⇙	\nSwarrow
⃯	\nlcirclearrowdown	⇘	\nNwsearrow	⇙	\nswarrowtail
⃮	\nlcirclearrowleft	⇘	\nnwsearrows	⇙	\nswlsquigarrow
⃭	\nlcirclearrowright	⃯	\nrcirclearrowdown	⇙	\nswmapsto
⃬	\nlcirclearrowup	⃮	\nrcirclearrowleft	⇙	\nswnearrows
⇜	\nlcurvearrowdown	⃭	\nrcirclearrowright	⇙	\nswrsquigarrow
↜	\nlcurvearrowleft	⃬	\nrcirclearrowup	⇙	\nswswarrows
⇗	\nlcurvearrowne	⇝	\nrcurvearrowdown	⇊	\ntwoheaddownarrow
⇖	\nlcurvearrownw	↜	\nrcurvearrowleft	↞	\ntwoheadleftarrow
⇁	\nlcurvearrowright	⇗	\nrcurvearrowne	⇗	\ntwoheadnearrow
⇘	\nlcurvearrowse	⇖	\nrcurvearrownw	⇖	\ntwoheadnwarrow
⇙	\nlcurvearrowsw	⇁	\nrcurvearrowright	↠	\ntwoheadrightarrow
⇜	\nlcurvearrowup	⇘	\nrcurvearrowse	⇘	\ntwoheadsearrow
⇍	\nLeftarrow	⇙	\nrcurvearrowsw	⇙	\ntwoheadswarrow
↚	\nleftarrow	⇜	\nrcurvearrowup	↟	\ntwoheaduparrow
↚	\nleftarrowtail	↓	\nrhookdownarrow	↑	\nuparrow
⇇	\nleftleftarrows	↚	\nrhookleftarrow	⇑	\nUparrow
⇜	\nleftlsquigarrow	⇗	\nrhooknearrow	↟	\nuparrowtail
↚	\nleftmapsto	⇖	\nrhooknwarrow	↕	\nupdownarrow
↮	\nleftrightarrow	↛	\nrhookrightarrow	⇕	\nUpdownarrow
⇎	\nLeftrightarrow	⇘	\nrhooksearrow	⇅	\nupdownarrows
⇆	\nleftrightarrows	⇙	\nrhookswarrow	↿	\nuplsquigarrow
⇜	\nleftrsquigarrow	↾	\nrhookuparrow	↥	\nupmapsto
↓	\nlhookdownarrow	↛	\nrightarrow	↿	\nuprsquigarrow
↚	\nlhookleftarrow	⇏	\nRightarrow	⇈	\nupuparrows
⇗	\nlhooknearrow	↣	\nrightarrowtail		

MnSymbol additionally defines synonyms for some of the preceding symbols:

⟲	`\ncirclearrowleft`	(same as `\nrcirclearrowup`)
⟳	`\ncirclearrowright`	(same as `\nlcirclearrowup`)
↶	`\ncurvearrowleft`	(same as `\nrcurvearrowleft`)
↷	`\ncurvearrowright`	(same as `\nlcurvearrowright`)
-/→	`\ndasharrow`	(same as `\ndashedrightarrow`)
←/-	`\ndashleftarrow`	(same as `\ndashedleftarrow`)
-/→	`\ndashrightarrow`	(same as `\ndashedrightarrow`)
↚	`\ngets`	(same as `\nleftarrow`)
↚	`\nhookleftarrow`	(same as `\nrhookleftarrow`)
↛	`\nhookrightarrow`	(same as `\nlhookrightarrow`)
↛	`\nleadsto`	(same as `\nrightlsquigarrow`)
↮	`\nleftrightsquigarrow`	(same as `\nsquigarrowleftright`)
↦	`\nmapsto`	(same as `\nrightmapsto`)
↛	`\nrightsquigarrow`	(same as `\nrightlsquigarrow`)
↛	`\nto`	(same as `\nrightarrow`)

Table 115: MnSymbol Harpoons

↓	`\downharpoonccw`*	⇙	`\neswharpoons`	↘	`\seharpooncw`
↓	`\downharpooncw`*	↗	`\neswharpoonsenw`	⇘	`\senwharpoons`
⇓	`\downupharpoons`	↖	`\nwharpoonccw`	↙	`\swharpoonccw`
←	`\leftharpoonccw`*	↖	`\nwharpooncw`	↙	`\swharpooncw`
←	`\leftharpooncw`*	↘	`\nwseharpoonnesw`	⇗	`\swneharpoons`
↔	`\leftrightharpoondownup`	⇘	`\nwseharpoons`	⇂	`\updownharpoonleftright`
⇋	`\leftrightharpoons`	↘	`\nwseharpoonswne`	⇃	`\updownharpoonrightleft`
↔	`\leftrightharpoonupdown`	→	`\rightharpoonccw`*	⇅	`\updownharpoons`
↗	`\neharpoonccw`	→	`\rightharpooncw`*	↑	`\upharpoonccw`*
↗	`\neharpooncw`	⇌	`\rightleftharpoons`	↑	`\upharpooncw`*
↙	`\neswharpoonnwse`	↘	`\seharpoonccw`		

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

Table 116: MnSymbol Negated Harpoons

↓	`\ndownharpoonccw`*	⇙	`\nneswharpoons`	↘	`\nseharpooncw`
↓	`\ndownharpooncw`*	↗	`\nneswharpoonsenw`	⇘	`\nsenwharpoons`
⇓	`\ndownupharpoons`	↖	`\nnwharpoonccw`	↙	`\nswharpoonccw`
←	`\nleftharpoonccw`*	↖	`\nnwharpooncw`	↙	`\nswharpooncw`
←	`\nleftharpooncw`*	↘	`\nnwseharpoonnesw`	⇗	`\nswneharpoons`
↔	`\nleftrightharpoondownup`	⇘	`\nnwseharpoons`	⇂	`\nupdownharpoonleftright`
⇋	`\nleftrightharpoons`	↘	`\nnwseharpoonswne`	⇃	`\nupdownharpoonrightleft`
↔	`\nleftrightharpoonupdown`	→	`\nrightharpoonccw`*	⇅	`\nupdownharpoons`
↗	`\nneharpoonccw`	→	`\nrightharpooncw`*	↑	`\nupharpoonccw`*
↗	`\nneharpooncw`	⇌	`\nrightleftharpoons`	↑	`\nupharpooncw`*
↙	`\nneswharpoonnwse`	↘	`\nseharpoonccw`		

* 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

$\overleftharp{abc}$	`\overleftharp{abc}`	$\overrightharpdown{abc}$	`\overrightharpdown{abc}`	$\underrightharp{abc}$	`\underrightharp{abc}`
$\overleftharpdown{abc}$	`\overleftharpdown{abc}`	$\underleftharp{abc}$	`\underleftharp{abc}`	$\underrightharpdown{abc}$	`\underrightharpdown{abc}`
$\overrightharp{abc}$	`\overrightharp{abc}`	$\underleftharpdown{abc}$	`\underleftharpdown{abc}`		

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

→	`\chemarrow`

Table 119: fge Arrows

⇻	`\fgerightarrow`	⇞	`\fgeuparrow`

Table 120: MnSymbol Spoons

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

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

Table 121: MnSymbol Pitchforks

	`\downpitchfork`		`\nnwpitchfork`		`\rightpitchfork`
	`\leftpitchfork`		`\nrightpitchfork`		`\sepitchfork`
	`\ndownpitchfork`		`\nsepitchfork`		`\swpitchfork`
	`\nepitchfork`		`\nswpitchfork`		`\uppitchfork`
	`\nleftpitchfork`		`\nuppitchfork`		
	`\nnepitchfork`		`\nwpitchfork`		

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

Table 122: MnSymbol Smiles and Frowns

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

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

Table 123: ulsy Contradiction Symbols

↯	`\blitza`	↯	`\blitzb`	↯	`\blitzc`	↯	`\blitzd`	↯	`\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

	\mapsfromchar		\mapstochar
	\Mapsfromchar		\Mapstochar

Table 128: Log-like Symbols

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

Calling the above "symbols" may be a bit misleading.[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 LaTeX [Dow00] for samples.

Table 129: $\mathcal{AMS}$ Log-like Symbols

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

Load the amsmath package to get these symbols. See Section 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 LaTeX [Dow00] for samples.

Table 130: GNU LaTeX 2e Number Sets

$\mathbb{C}$	\Complex	$\mathbb{Z}$	\Integer	$\mathbb{N}$	\Natural	$\mathbb{Q}$	\Rational	$\mathbb{R}$	\Real
$\mathbf{C}$	\COMPLEX	$\mathbf{Z}$	\INTEGER	$\mathbf{N}$	\NATURAL	$\mathbf{Q}$	\RATIONAL	$\mathbf{R}$	\REAL

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

Table 131: Greek Letters

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

The remaining Greek majuscules can be produced with ordinary Latin letters. The symbol "M", for instance, is used for both an uppercase "m" and an uppercase "μ".

See Section 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: $\mathcal{AMS}$ Greek Letters

$\digamma$	\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

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

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

Table 135: fourier Variant Greek Letters

π	\pi	ρ	\rho
ϖ	\varpi	ϱ	\varrho
$\varvarpi$	\varvarpi	$\varvarrho$	\varvarrho

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: $\mathcal{AMS}$ Hebrew Letters

ב	\beth	ג	\gimel	ד	\daleth

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

Table 138: MnSymbol Hebrew Letters

א	\aleph	ב	\beth	ג	\gimel	ד	\daleth

Table 139: Letter-like Symbols

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

TABLE 140: $\mathcal{AMS}$ Letter-like Symbols

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

TABLE 141: txfonts/pxfonts Letter-like Symbols

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

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

TABLE 142: mathabx Letter-like Symbols

$\bar{\in}$	`\barin`	$\in$	`\in`	$\not\top$	`\nottop`	$\notin$	`\varnotin`
$\complement$	`\complement`	$\nexists$	`\nexists`	$\ni$	`\owns`	$\notni$	`\varnotowner`
$\exists$	`\exists`	$\not\perp$	`\notbot`	$\supseteq$	`\ownsbar`		
$\Finv$	`\Finv`	$\notin$	`\notin`	∂	`\partial`		
$\Game$	`\Game`	$\notni$	`\notowner`	$\partialslash$	`\partialslash`		

TABLE 143: MnSymbol Letter-like Symbols

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

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

TABLE 144: trfsigns Letter-like Symbols

e	`\e`	j	`\im`

TABLE 145: mathdesign Letter-like Symbols

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

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

TABLE 146: fge Letter-like Symbols

∀	\fgeA	ℊ	\fgeeszett	⅁	\fgeleftB	⅄	\fgeU
ↄ	\fgec	ⅎ	\fgeF	Ↄ	\fgeleftC		
⅌	\fged	⅋	\fgef	⅂	\fgerightB		
ɘ	\fgee	⅏	\fgelb*	ſ	\fges		

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

TABLE 147: fourier Letter-like Symbols

∂	\partial
∂	\varpartialdiff

TABLE 148: $\mathcal{AMS}$ Delimiters

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

TABLE 149: stmaryrd Delimiters

⦉	\Lbag	⦊	\Rbag	⦇	\lbag	⦈	\rbag
⫡	\llceil	⫢	\rrceil	⫷	\llfloor	⫸	\rrfloor
⦅	\llparenthesis	⦆	\rrparenthesis				

TABLE 150: mathabx Delimiters

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

TABLE 151: nath Delimiters

∟	\niv	⌟	\vin

TABLE 152: Variable-sized Delimiters

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

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

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

TABLE 154: $\mathcal{AMS}$ Variable-sized Delimiters

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

According to the amsmath documentation [AMS99], the preceding symbols are intended to be used as delimiters (e.g., as in "$|-z|$") while the `\vert` and `\Vert` symbols (Table 152) are intended to be used as operators (e.g., as in "$p|q$").

TABLE 155: stmaryrd Variable-sized Delimiters

$[\![$	$\left[\!\left[\right.$	`\llbracket`	$]\!]$	$\left.\right]\!]$	`\rrbracket`

TABLE 156: mathabx Variable-sized Delimiters

⟦	⟦	\ldbrack	⟧	⟧	\rdbrack
⧘	⧘	\lfilet	⧙	⧙	\rfilet
|	|	\thickvert	⦀	⦀	\vvvert

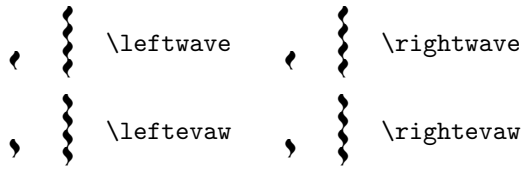
TABLE 157: MnSymbol Variable-sized Delimiters

⌈	⌈	\lceil	⌉	⌉	\rceil
⌊	⌊	\lfloor	⌋	⌋	\rfloor
⦚	⦚	\lwavy	⦚	⦚	\rwavy
⦙	⦙	\lWavy	⦙	⦙	\rWavy
(	(	(	)	)	)
⟦	⟦	\lsem	⟧	⟧	\rsem
∫	∫	\lmoustache	⌋	⌋	\rmoustache
/	/	/	\	\	\backslash
[	[	[	]	]	]
|	|	|	‖	‖	\\|
↓	↓	\arrowvert	‖	‖	\Arrowvert

⌜	⌜	\ulcorner	⌝	⌝	\urcorner
⌞	⌞	\llcorner	⌟	⌟	\lrcorner
⟨	⟨	\langle	⟩	⟩	\rangle
⧼	⧼	\langlebar	⧽	⧽	\ranglebar
(	(	\lgroup	)	)	\rgroup
⟪	⟪	\llangle	⟫	⟫	\rrangle
{	{	\lbrace	}	}	\rbrace
⟨	⟨	<	⟩	⟩	>
⌜ ⌞	⌜ ⌞	\ullcorner	⌝ ⌟	⌝ ⌟	\ulrcorner
|	|	\bracevert			

`\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



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

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

All of the symbols in Table 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)

⋘	⋘	\triple<	⋙	⋙	\triple>
⟦⟦	⟦⟦	\triple[	⟧⟧	⟧⟧	\triple]
⦀	⦀	\ltriple|*	⦀	⦀	\rtriple|*

* 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

⟦	⟦	\llbracket	⟧	⟧	\rrbracket
⦀	⦀	\VERT			

Table 162: textcomp Text-mode Delimiters

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

Table 163: metre Text-mode Delimiters

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

Table 164: Math-mode Accents

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

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

TABLE 165: $\mathcal{AMS}$ Math-mode Accents

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

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

TABLE 166: MnSymbol Math-mode Accents

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

TABLE 167: fge Math-mode Accents

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

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

TABLE 168: yhmath Math-mode Accents

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

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

TABLE 169: Extensible Accents

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

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

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

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

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

TABLE 170: overrightarrow Extensible Accents

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

TABLE 171: yhmath Extensible Accents

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

TABLE 172: $\mathcal{AMS}$ Extensible Accents

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

TABLE 173: MnSymbol Extensible Accents

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

TABLE 174: mathtools Extensible Accents

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

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

TABLE 175: mathabx Extensible Accents

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

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

TABLE 176: fourier Extensible Accents

$\widearc{abc}$	`\widearc{abc}`	$\wideparen{abc}$	`\wideparen{abc}`
$\wideOarc{abc}$	`\wideOarc{abc}`	$\widering{abc}$	`\widering{abc}`

Table 177: esvect Extensible Accents

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

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

Table 178: undertilde Extensible Accents

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

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

Table 179: ushort Extensible Accents

$\underline{\underline{abc}}$	`\ushortdw{abc}`	$\underline{abc}$	`\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 "$\underline{x}\,\underline{y}\underline{xy}$".

Table 180: $\mathcal{AMS}$ Extensible Arrows

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

TABLE 181: mathtools Extensible Arrows

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

TABLE 182: chemarr Extensible Arrows

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

TABLE 183: chemarrow Extensible Arrows

$\xleftarrow[def]{abc}$	`\autoleftarrow{abc}{def}`	$\xrightarrow[def]{abc}$	`\autorightarrow{abc}{def}`
$\xleftrightharpoons[def]{abc}$	`\autoleftrightharpoons{abc}{def}`	$\xrightleftharpoons[def]{abc}$	`\autorightleftharpoons{abc}{def}`

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

TABLE 184: extarrows Extensible Arrows

$\xLeftrightarrow{abc}$	`\xLeftrightarrow{abc}`	$\xLongleftrightarrow{abc}$	`\xLongleftrightarrow{abc}`
$\xleftrightarrow{abc}$	`\xleftrightarrow{abc}`	$\xlongleftrightarrow{abc}$	`\xlongleftrightarrow{abc}`
$\xlongequal{abc}$	`\xlongequal{abc}`	$\xLongrightarrow{abc}$	`\xLongrightarrow{abc}`
$\xLongleftarrow{abc}$	`\xLongleftarrow{abc}`	$\xlongrightarrow{abc}$	`\xlongrightarrow{abc}`
$\xlongleftarrow{abc}$	`\xlongleftarrow{abc}`		

Table 185: extpfeil Extensible Arrows

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

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

Table 186: DotArrow Extensible Arrows

$\overset{a}{\dashrightarrow}$	`\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

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

Table 188: holtpolt Non-commutative Division Symbols

$\left\lfloor \begin{smallmatrix} abc \\ def \end{smallmatrix} \right\rfloor$	`\holter{abc}{def}`	$\left\lceil \begin{smallmatrix} abc \\ def \end{smallmatrix} \right\rceil$	`\polter{abc}{def}`

Table 189: Dots

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

* While ":" is valid in math mode, `\colon` uses different surrounding spacing. See Section 8.4 and the Short Math Guide for LaTeX [Dow00] for more information on math-mode spacing.

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

Table 190: $\mathcal{AMS}$ Dots

⋱	\because*	⋯	\dotsi	∴	\therefore*
⋯	\dotsb	⋯	\dotsm		
…	\dotsc	…	\dotso		

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

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

Table 191: wasysym Dots

∴	\wasytherefore

Table 192: MnSymbol Dots

⋅	\cdot	⋰	\hdotdot	⋰	\udots
⋱	\ddotdot	⋯	\hdots	∴	\uptherefore
⋱	\ddots	⋰	\leftthere fore	⋮	\vdotdot
⋱	\diamonddots	⋮	\rightthere fore	⋮	\vdots
⋱	\downtherefore	⋮	\squaredots		
⋱	\fivedots	⋰	\udotdot		

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

All of the above except \hdots and \vdots are defined as binary operators and therefore also appear in Table 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

⋰	\iddots

Table 194: yhmath Dots

⋰	\adots

Table 195: teubner Dots

:	\:	⋮	\;	⋮	\?	::	\antilabe

TABLE 196: mathcomp Math Symbols

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

TABLE 197: marvosym Digits

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

TABLE 198: fge Digits

0	\fgestruckzero	1	\fgestruckone

TABLE 199: dozenal Base-12 Digits

↊	\x	↋	\e

TABLE 200: mathabx Mayan Digits

𝋀	\maya{0}	𝋁	\maya{2}	𝋂	\maya{4}
𝋀	\maya{1}	𝋁	\maya{3}	𝋂	\maya{5}

TABLE 201: Miscellaneous LaTeX 2_ε Math Symbols

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

* Not predefined in LaTeX 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 $\mathcal{AMS}$'s \varnothing ("∅", Table 202) to that of LaTeX's \emptyset.

TABLE 202: Miscellaneous $\mathcal{AMS}$ Math Symbols

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

TABLE 203: Miscellaneous wasysym Math Symbols

□	\Box	◇	\Diamond	℧	\mho*	⦟	\varangle

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

TABLE 204: Miscellaneous txfonts/pxfonts Math Symbols

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

TABLE 205: Miscellaneous mathabx Math Symbols

∘	\degree	⁗	\fourth	⦟	\measuredangle	″	\second
╲	\diagdown	#	\hash	⫛	\pitchfork	⦞	\sphericalangle
╱	\diagup	∞	\infty	∝	\propto	‴	\third
∅	\diameter	⋉	\leftthreetimes	⋋	\rightthreetimes	#	\varhash

TABLE 206: Miscellaneous MnSymbol Math Symbols

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

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

Table 207: Miscellaneous Internal MnSymbol Math Symbols

⋯	\partialvardint	⋯	\partialvartint
⌣	\partialvardlanddownint	⌣	\partialvartlanddownint
⌢	\partialvardlandupint	⌢	\partialvartlandupint
↺	\partialvardlcircleleftint	↺	\partialvartlcircleleftint
↻	\partialvardlcirclerightint	↻	\partialvartlcirclerightint
⬭	\partialvardoiint	⬭	\partialvartoiint
○	\partialvardoint	○	\partialvartoint
↺	\partialvardrcircleleftint	↺	\partialvartrcircleleftint
↻	\partialvardrcirclerightint	↻	\partialvartrcirclerightint
⁻	\partialvardstrokedint	⁻	\partialvartstrokedint
∑	\partialvardsumint	Σ	\partialvartsumint

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

Table 208: Miscellaneous textcomp Text-mode Math Symbols

°	\textdegree*	$\frac{1}{2}$	\textonehalf†	$\frac{3}{4}$	\textthreequarters†
÷	\textdiv	$\frac{1}{4}$	\textonequarter†	^{3}	\textthreesuperior
/	\textfractionsolidus	^{1}	\textonesuperior	×	\texttimes
¬	\textlnot	±	\textpm	^{2}	\texttwosuperior
—	\textminus	√	\textsurd		

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

† nicefrac (part of the units package) 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

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

Table 210: Miscellaneous fge Math Symbols

\	\fgebackslash	⌒	\fgecap	⌣́	\fgecupacute	⌜	\fgelangle
⌣́	\fgebaracute	⌓	\fgecapbar	⌣̄	\fgecupbar	⌟	\fgeupbracket
⌓̄	\fgebarcap	⌣	\fgecup	⌒⌣	\fgeinfty		

Table 211: Miscellaneous mathdesign Math Symbols

∟	\rightangle

Table 212: Miscellaneous arev Math Symbols

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

TABLE 213: Math Alphabets

Font sample	Generating command	Required package
ABCdef123	`\mathrm{ABCdef123}`	*none*
ABCdef123	`\mathit{ABCdef123}`	*none*
ABCdef123	`\mathnormal{ABCdef123}`	*none*
$\mathcal{ABC}$	`\mathcal{ABC}`	*none*
$\mathscr{ABC}$	`\mathscr{ABC}`	mathrsfs
or	`\mathcal{ABC}`	calrsfs
$\mathcal{ABC}$	`\mathcal{ABC}`	euscript with the mathcal option
or	`\mathscr{ABC}`	euscript with the mathscr option
$\mathpzc{ABCdef123}$	`\mathpzc{ABCdef123}`	*none*; manually defined*
$\mathbb{ABC}$	`\mathbb{ABC}`	amsfonts,§ amssymb, txfonts, or pxfonts
$\varmathbb{ABC}$	`\varmathbb{ABC}`	txfonts or pxfonts
$\mathbb{ABCdef123}$	`\mathbb{ABCdef123}`	bbold or mathbbol†
$\mathbb{ABCdef123}$	`\mathbb{ABCdef123}`	mbboard†
$\mathbbm{ABCdef12}$	`\mathbbm{ABCdef12}`	bbm
$\mathbbmss{ABCdef12}$	`\mathbbmss{ABCdef12}`	bbm
$\mathbbmtt{ABCdef12}$	`\mathbbmtt{ABCdef12}`	bbm
$\mathbb{ABC1}$	`\mathbb{ABC1}`	dsfont
$\varmathbb{ABC1}$	`\mathbb{ABC1}`	dsfont with the sans option
$\mathbb{ABC}$	`\symA\symB\symC`	china2e‡
$\mathfrak{ABCdef123}$	`\mathfrak{ABCdef123}`	eufrak
$\mathfrak{ABCdef123}$	`\textfrak{ABCdef123}`	yfonts¶
$\mathfrak{ABCdef123}$	`\textswab{ABCdef123}`	yfonts¶
$\mathfrak{ABCdef123}$	`\textgoth{ABCdef123}`	yfonts¶

* Put "`\DeclareMathAlphabet{\mathpzc}{OT1}{pzc}{m}{it}`" in your document's preamble to make `\mathpzc` typeset its argument in Zapf Chancery. As a similar trick, you can typeset the Calligra font's script "$\mathscr{z}$" (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, "$\mathbb{\langle\lbrack\lparen\alpha\beta\gamma\rparen\rbrack\rangle}$" is produced by "`\mathbb{\Langle\Lbrack\Lparen\bbalpha\bbbeta\bbgamma\Rparen\Rbrack\Rangle}`".

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

‡ The `\sym...` commands provided by the LaTeX2e 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, LaTeX2e provides three umlauted blackboard-bold letters: `\symAE` ("Ä"), `\symOE` ("Ö"), and `\symUE` ("Ü"). Note that LaTeX2e 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 $\mathcal{AMS}$'s fonts rendered $\mathbb{C}$, $\mathbb{N}$, $\mathbb{R}$, $\mathbb{S}$, and $\mathbb{Z}$ as $\mathbb{C}$, $\mathbb{N}$, $\mathbb{R}$, $\mathbb{S}$, and $\mathbb{Z}$. As some people prefer the older glyphs—much to the $\mathcal{AMS}$'s surprise—and because those glyphs fail to build under modern versions of METAFONT, Berthold Horn uploaded PostScript fonts for the older blackboard-bold glyphs to CTAN, to the `fonts/msym10` directory. As of this writing, however, there are no LaTeX 2_ε packages for utilizing the now-obsolete glyphs.

4 Science and technology symbols

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

TABLE 214: gensymb Symbols Defined to Work in Both Math and Text Mode

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

TABLE 215: wasysym Electrical and Physical Symbols

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

TABLE 216: ifsym Pulse Diagram Symbols

⅂	`\FallingEdge`	⅂_⅃	`\LongPulseLow`	⅂⅃	`\PulseLow`	⅄	`\ShortPulseHigh`
⅃⅂⅃	`\LongPulseHigh`	⅃⅂	`\PulseHigh`	⅃	`\RaisingEdge`	⅂	`\ShortPulseLow`

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

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

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

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

TABLE 217: ar Aspect Ratio Symbol

Æ	`\AR`

TABLE 218: textcomp Text-mode Science and Engineering Symbols

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

TABLE 219: steinmetz Extensible Phasor Symbol

∠*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	Ψ	\Neptune	♁	\varEarth
○	\fullmoon	☾	\leftmoon	●	\newmoon	☽	\rightmoon	⊙	\Sun
♈	\Aries	♉	\Taurus	♊	\Gemini				

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

TABLE 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{}

TABLE 225: marvosym Computer Hardware Symbols

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

TABLE 226: keystroke Computer Keys

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

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

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

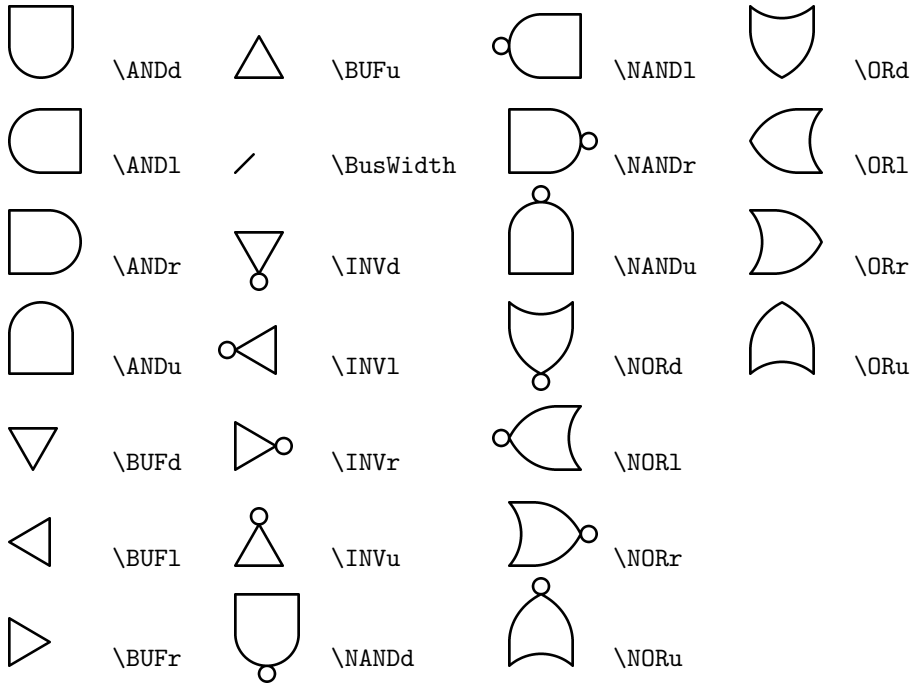
The \keystroke command draws a key with an arbitrary label. For example, "\keystroke{F7}" produces " F7 ".

TABLE 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 2_ε 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	\fax		\Faxmachine		\Lightning		\Pickup
	\Emailct	FAX	\FAX		\Letter		\Mobilefone		\Telefon

TABLE 230: marvosym Engineering Symbols

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

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

TABLE 231: wasysym Biological Symbols

♀	\female	♂	\male

TABLE 232: marvosym Biological Symbols

♀	\Female	⚤	\FemaleMale	□	\MALE	○	\Neutral
⚲	\FEMALE	⚥	\Hermaphrodite	♂	\Male		
⚢	\FemaleFemale	⚲	\HERMAPHRODITE	⚣	\MaleMale		

TABLE 233: marvosym Safety-related Symbols

☣	\Biohazard	CE	\CEsign	Ex	\Explosionsafe	☢	\Radioactivity
XE	\BSEfree	⚠	\Estatically		\Laserbeam	STOP	\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{hs}
	\feyn{c}		\feyn{fv}		\feyn{glu}		\feyn{hu}
	\feyn{f}		\feyn{g}		\feyn{gu}		\feyn{m}
	\feyn{fd}		\feyn{g1}		\feyn{gv}		\feyn{ms}
	\feyn{fl}		\feyn{gd}		\feyn{gvs}		\feyn{p}
	\feyn{flS}		\feyn{gl}		\feyn{h}		\feyn{P}
	\feyn{fs}		\feyn{glB}		\feyn{hd}		\feyn{x}

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

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

5 Dingbats

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

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

Table 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

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

\largepencil \smallpencil

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

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

Table 250: bbding Xs and Check Marks

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

Table 251: pifont Xs and Check Marks

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

Table 252: wasysym Xs and Check Marks

☑	\CheckedBox	□	\Square	☒	\XBox

Table 253: universal Xs

✖	\baucross

Table 254: pifont Circled Numbers

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

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

Table 255: wasysym Stars

✡	\davidsstar	✳	\hexstar	✳	\varhexstar

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

TABLE 256: bbding Stars, Flowers, and Similar Shapes

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

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		\floweroneright
	\aldineleft	✧	\decosix		\leafleft
	\aldineright		\decothreeleft		\leafNE
	\aldinesmall		\decothreeright		\leafright
	\decofourleft		\decotwo	✦	\starredbullet
	\decofourright		\floweroneleft		

TABLE 259: wasysym Geometric Shapes

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

TABLE 260: MnSymbol Geometric Shapes

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

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

TABLE 261: ifsym Geometric Shapes

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

The ifsym documentation points out that one can use \rlap to combine some of the above into useful, new symbols. For example, \BigCircle and \FilledSmallCircle combine to give "◉". Likewise, \Square and \Cross combine to give "⊠". See Section 8.3 for more information about constructing new symbols out of existing symbols.

TABLE 262: bbding Geometric Shapes

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

TABLE 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

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 bbding 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		\PHstrainer
	\PHchild		\PHmanacles		\PHtattooedHead
	\PHclub		\PHmattock		\PHtiara
	\PHcolumn		\PHoxBack		\PHtunny
	\PHcomb		\PHpapyrus		\PHvine
	\PHdolium		\PHpedestrian		\PHwavyBand
	\PHdove		\PHplaneTree		\PHwoman

Table 270: protosem Proto-Semitic Characters

𐤀	\Aaleph	𐤄	\AAhe	𐤊	\Akaph	𐤎	\Asamekh	𐤓	\AAresh
𐤁	\AAaleph	𐤆	\Azayin	𐤋	\AAkaph	𐤐	\Ape	𐤔	\Ashin
𐤂	\Abeth	𐤅	\Avav	𐤌	\Alamed	𐤑	\AApe	𐤕	\Ahelmet
𐤃	\AAbeth	𐤇	\Aheth	𐤍	\AAlamed	𐤒	\Asade	𐤖	\AAhelmet
𐤄	\Agimel	𐤈	\AAheth	𐤎	\Amem	𐤓	\AAsade	𐤗	\Atav
𐤅	\Adaleth	𐤉	\Ateth	𐤏	\Anun	𐤔	\Aqoph		
𐤆	\AAdaleth	𐤊	\Ayod	𐤐	\Aayin	𐤕	\AAqoph		
𐤇	\Ahe	𐤋	\AAyod	𐤑	\AAayin	𐤖	\Aresh		

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

TABLE 271: hieroglf Hieroglyphics

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

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

TABLE 272: linearA Linear A Script

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

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𐘤	\LinearAXIV	𐙉	\LinearACXII	𐚤	\LinearACCX	𐛛	\LinearACCCVIII
𐘥	\LinearAXV	𐙊	\LinearACXIII	𐚥	\LinearACCXI	𐛜	\LinearACCCIX
𐘦	\LinearAXVI	𐙋	\LinearACXIV	𐚦	\LinearACCXII	𐛝	\LinearACCCX
𐘧	\LinearAXVII	𐙌	\LinearACXV	𐚧	\LinearACCXIII	𐛞	\LinearACCCXI
𐘨	\LinearAXVIII	𐙍	\LinearACXVI	𐚨	\LinearACCXIV	𐛟	\LinearACCCXII
𐘩	\LinearAXIX	𐙎	\LinearACXVII	𐚩	\LinearACCXV	𐛠	\LinearACCCXIII
𐘪	\LinearAXX	𐙏	\LinearACXVIII	𐚪	\LinearACCXVI	𐛡	\LinearACCCXIV
𐘫	\LinearAXXI	𐙐	\LinearACXIX	𐚫	\LinearACCXVII	𐛢	\LinearACCCXV
𐘬	\LinearAXXII	𐙑	\LinearACXX	𐚬	\LinearACCXVIII	𐛣	\LinearACCCXVI
𐘭	\LinearAXXIII	𐙒	\LinearACXXI	𐚭	\LinearACCXIX	𐛤	\LinearACCCXVII
𐘮	\LinearAXXIV	𐙓	\LinearACXXII	𐚮	\LinearACCXX	𐛥	\LinearACCCXVIII
𐘯	\LinearAXXV	𐙔	\LinearACXXIII	𐚯	\LinearACCXXI	𐛦	\LinearACCCXIX
𐘰	\LinearAXXVI	𐙕	\LinearACXXIV	𐚰	\LinearACCXXII	𐛧	\LinearACCCXX
𐘱	\LinearAXXVII	𐙖	\LinearACXXV	𐚱	\LinearACCXXIII	𐛨	\LinearACCCXXI
𐘲	\LinearAXXVIII	𐙗	\LinearACXXVI	𐚲	\LinearACCXXIV	𐛩	\LinearACCCXXII
𐘳	\LinearAXXIX	𐙘	\LinearACXXVII	𐚳	\LinearACCXXV	𐛪	\LinearACCCXXIII
𐘴	\LinearAXXX	𐙙	\LinearACXXVIII	𐚴	\LinearACCXXVI	𐛫	\LinearACCCXXIV
𐘵	\LinearAXXXI	𐙚	\LinearACXXIX	𐚵	\LinearACCXXVII	𐛬	\LinearACCCXXV
𐘶	\LinearAXXXII	𐙛	\LinearACXXX	𐚶	\LinearACCXXVIII	𐛭	\LinearACCCXXVI
𐘷	\LinearAXXXIII	𐙜	\LinearACXXXI	𐚷	\LinearACCXXIX	𐛮	\LinearACCCXXVII
𐘸	\LinearAXXXIV	𐙝	\LinearACXXXII	𐚸	\LinearACCXXX	𐛯	\LinearACCCXXVIII
𐘹	\LinearAXXXV	𐙞	\LinearACXXXIII	𐚹	\LinearACCXXXI	𐛰	\LinearACCCXXIX
𐘺	\LinearAXXXVI	𐙟	\LinearACXXXIV	𐚺	\LinearACCXXXII	𐛱	\LinearACCCXXX
𐘻	\LinearAXXXVII	𐙠	\LinearACXXXV	𐚻	\LinearACCXXXIII	𐛲	\LinearACCCXXXI
𐘼	\LinearAXXXVIII	𐙡	\LinearACXXXVI	𐚼	\LinearACCXXXIV	𐛳	\LinearACCCXXXII
𐘽	\LinearAXXXIX	𐙢	\LinearACXXXVII	𐚽	\LinearACCXXXV	𐛴	\LinearACCCXXXIII
𐘾	\LinearAXL	𐙣	\LinearACXXXVIII	𐚾	\LinearACCXXXVI	𐛵	\LinearACCCXXXIV
𐘿	\LinearAXLI	𐙤	\LinearACXXXIX	𐚿	\LinearACCXXXVII	𐛶	\LinearACCCXXXV
𐙀	\LinearAXLII	𐙥	\LinearACXL	𐛀	\LinearACCXXXVIII	𐛷	\LinearACCCXXXVI
𐙁	\LinearAXLIII	𐙦	\LinearACXLI	𐛁	\LinearACCXXXIX	𐛸	\LinearACCCXXXVII
𐙂	\LinearAXLIV	𐙧	\LinearACXLII	𐛂	\LinearACCXL	𐛹	\LinearACCCXXXVIII
𐙃	\LinearAXLV	𐙨	\LinearACXLIII	𐛃	\LinearACCXLI	𐛺	\LinearACCCXXXIX
𐙄	\LinearAXLVI	𐙩	\LinearACXLIV	𐛄	\LinearACCXLII	𐛻	\LinearACCCXL
𐙅	\LinearAXLVII	𐙪	\LinearACXLV	𐛅	\LinearACCXLIII	𐛼	\LinearACCCXLI
𐙆	\LinearAXLVIII	𐙫	\LinearACXLVI	𐛆	\LinearACCXLIV	𐛽	\LinearACCCXLII
𐙇	\LinearAXLIX	𐙬	\LinearACXLVII	𐛇	\LinearACCXLV	𐛾	\LinearACCCXLIII
𐙈	\LinearAL	𐙭	\LinearACXLVIII	𐛈	\LinearACCXLVI	𐛿	\LinearACCCXLIV
𐙉	\LinearALI	𐙮	\LinearACXLIX	𐛉	\LinearACCXLVII	𐜀	\LinearACCCXLV
𐙊	\LinearALII	𐙯	\LinearACL	𐛊	\LinearACCXLVIII	𐜁	\LinearACCCXLVI
𐙋	\LinearALIII	𐙰	\LinearACLI	𐛋	\LinearACCXLIX	𐜂	\LinearACCCXLVII
𐙌	\LinearALIV	𐙱	\LinearACLII	𐛌	\LinearACCL	𐜃	\LinearACCCXLVIII
𐙍	\LinearALV	𐙲	\LinearACLIII	𐛍	\LinearACCLI	𐜄	\LinearACCCXLIX
𐙎	\LinearALVI	𐙳	\LinearACLIV	𐛎	\LinearACCLII	𐜅	\LinearACCCL
𐙏	\LinearALVII	𐙴	\LinearACLV	𐛏	\LinearACCLIII	𐜆	\LinearACCCLI
𐙐	\LinearALVIII	𐙵	\LinearACLVI	𐛐	\LinearACCLIV	𐜇	\LinearACCCLII
𐙑	\LinearALIX	𐙶	\LinearACLVII	𐛑	\LinearACCLV	𐜈	\LinearACCCLIII
𐙒	\LinearALX	𐙷	\LinearACLVIII	𐛒	\LinearACCLVI	𐜉	\LinearACCCLIV
𐙓	\LinearALXI	𐙸	\LinearACLIX	𐛓	\LinearACCLVII	𐜊	\LinearACCCLV
𐙔	\LinearALXII	𐙹	\LinearACLX	𐛔	\LinearACCLVIII	𐜋	\LinearACCCLVI
𐙕	\LinearALXIII	𐙺	\LinearACLXI	𐛕	\LinearACCLIX	𐜌	\LinearACCCLVII
𐙖	\LinearALXIV	𐙻	\LinearACLXII	𐛖	\LinearACCLX	𐜍	\LinearACCCLVIII
𐙗	\LinearALXV	𐙼	\LinearACLXIII	𐛗	\LinearACCLXI	𐜎	\LinearACCCLIX

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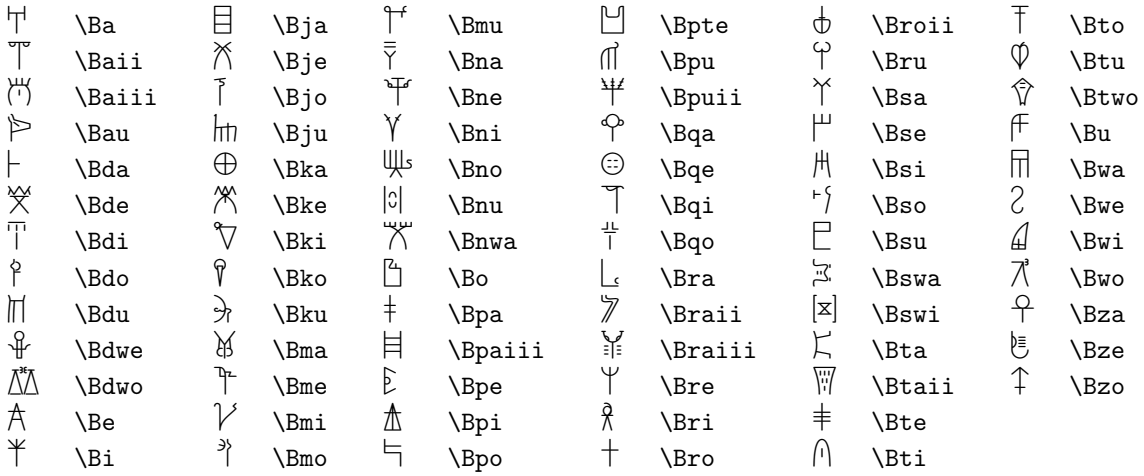
\LinearALXVI	\LinearACLXIV	\LinearACCLXII	\LinearACCCLX
\LinearALXVII	\LinearACLXV	\LinearACCLXIII	\LinearACCCLXI
\LinearALXVIII	\LinearACLXVI	\LinearACCLXIV	\LinearACCCLXII
\LinearALXIX	\LinearACLXVII	\LinearACCLXV	\LinearACCCLXIII
\LinearALXX	\LinearACLXVIII	\LinearACCLXVI	\LinearACCCLXIV
\LinearALXXI	\LinearACLXIX	\LinearACCLXVII	\LinearACCCLXV
\LinearALXXII	\LinearACLXX	\LinearACCLXVIII	\LinearACCCLXVI
\LinearALXXIII	\LinearACLXXI	\LinearACCLXIX	\LinearACCCLXVII
\LinearALXXIV	\LinearACLXXII	\LinearACCLXX	\LinearACCCLXVIII
\LinearALXXV	\LinearACLXXIII	\LinearACCLXXI	\LinearACCCLXIX
\LinearALXXVI	\LinearACLXXIV	\LinearACCLXXII	\LinearACCCLXX
\LinearALXXVII	\LinearACLXXV	\LinearACCLXXIII	\LinearACCCLXXI
\LinearALXXVIII	\LinearACLXXVI	\LinearACCLXXIV	\LinearACCCLXXII
\LinearALXXIX	\LinearACLXXVII	\LinearACCLXXV	\LinearACCCLXXIII
\LinearALXXX	\LinearACLXXVIII	\LinearACCLXXVI	\LinearACCCLXXIV
\LinearALXXXI	\LinearACLXXIX	\LinearACCLXXVII	\LinearACCCLXXV
\LinearALXXXII	\LinearACLXXX	\LinearACCLXXVIII	\LinearACCCLXXVI
\LinearALXXXIII	\LinearACLXXXI	\LinearACCLXXIX	\LinearACCCLXXVII
\LinearALXXXIV	\LinearACLXXXII	\LinearACCLXXX	\LinearACCCLXXVIII
\LinearALXXXV	\LinearACLXXXIII	\LinearACCLXXXI	\LinearACCCLXXIX
\LinearALXXXVI	\LinearACLXXXIV	\LinearACCLXXXII	\LinearACCCLXXX
\LinearALXXXVII	\LinearACLXXXV	\LinearACCLXXXIII	\LinearACCCLXXXI
\LinearALXXXVIII	\LinearACLXXXVI	\LinearACCLXXXIV	\LinearACCCLXXXII
\LinearALXXXIX	\LinearACLXXXVII	\LinearACCLXXXV	\LinearACCCLXXXIII
\LinearALXXXX	\LinearACLXXXVIII	\LinearACCLXXXVI	\LinearACCCLXXXIV
\LinearAXCI	\LinearACLXXXIX	\LinearACCLXXXVII	\LinearACCCLXXXV
\LinearAXCII	\LinearACLXXXX	\LinearACCLXXXVIII	\LinearACCCLXXXVI
\LinearAXCIII	\LinearACXCI	\LinearACCLXXXIX	\LinearACCCLXXXVII
\LinearAXCIV	\LinearACXCII	\LinearACCLXXXX	\LinearACCCLXXXVIII
\LinearAXCV	\LinearACXCIII	\LinearACCXCI	\LinearACCCLXXXIX
\LinearAXCVI	\LinearACXCIV	\LinearACCXCII	
\LinearAXCVII	\LinearACXCV	\LinearACCXCIII	
\LinearAXCVIII	\LinearACXCVI	\LinearACCXCIV	

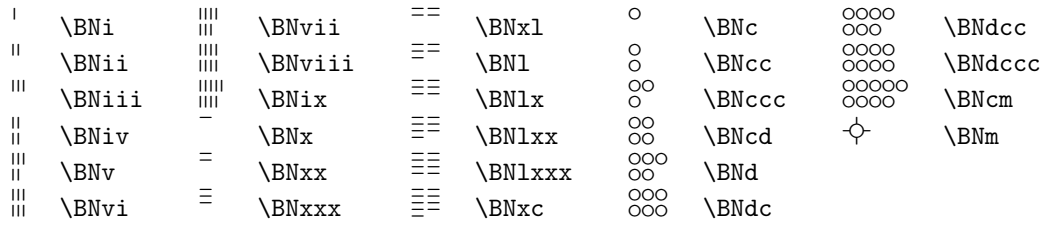
Table 273: linearb Linear B Basic and Optional Letters



𐀀	\Ba	𐀁	\Bja	𐀂	\Bmu	𐀃	\Bpte	𐀄	\Broii	𐀅	\Bto
𐀆	\Baii	𐀇	\Bje	𐀈	\Bna	𐀉	\Bpu	𐀊	\Bru	𐀋	\Btu
𐀌	\Baiii	𐀍	\Bjo	𐀎	\Bne	𐀏	\Bpuii	𐀐	\Bsa	𐀑	\Btwo
𐀒	\Bau	𐀓	\Bju	𐀔	\Bni	𐀕	\Bqa	𐀖	\Bse	𐀗	\Bu
𐀘	\Bda	𐀙	\Bka	𐀚	\Bno	𐀛	\Bqe	𐀜	\Bsi	𐀝	\Bwa
𐀞	\Bde	𐀟	\Bke	𐀠	\Bnu	𐀡	\Bqi	𐀢	\Bso	𐀣	\Bwe
𐀤	\Bdi	𐀥	\Bki	𐀦	\Bnwa	𐀧	\Bqo	𐀨	\Bsu	𐀩	\Bwi
𐀪	\Bdo	𐀫	\Bko	𐀬	\Bo	𐀭	\Bra	𐀮	\Bswa	𐀯	\Bwo
𐀰	\Bdu	𐀱	\Bku	𐀲	\Bpa	𐀳	\Braii	𐀴	\Bswi	𐀵	\Bza
𐀶	\Bdwe	𐀷	\Bma	𐀸	\Bpaiii	𐀹	\Braiii	𐀺	\Bta	𐀻	\Bze
𐀼	\Bdwo	𐀽	\Bme	𐀾	\Bpe	𐀿	\Bre	𐁀	\Btaii	𐁁	\Bzo
𐁂	\Be	𐁃	\Bmi	𐁄	\Bpi	𐁅	\Bri	𐁆	\Bte		
𐁇	\Bi	𐁈	\Bmo	𐁉	\Bpo	𐁊	\Bro	𐁋	\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 "𐁲𐁹𐁰𐁷𐁸", for example. See the linearb documentation for more information.

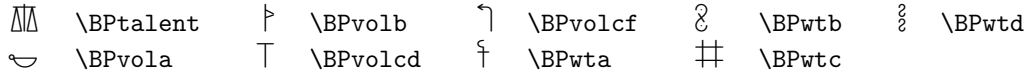
Table 274: linearb Linear B Numerals



𐁑	\BNi	𐁒	\BNvii	𐁓	\BNxl	𐁔	\BNc	𐁕	\BNdcc
𐁑𐁑	\BNii	𐁒𐁒	\BNviii	𐁓𐁓	\BNl	𐁔𐁔	\BNcc	𐁕𐁕	\BNdccc
𐁑𐁑𐁑	\BNiii	𐁒𐁒𐁒	\BNix	𐁓𐁓𐁓	\BNlx	𐁔𐁔𐁔	\BNccc	𐁕𐁕𐁕	\BNcm
𐁑𐁑𐁑𐁑	\BNiv	𐁒	\BNx	𐁓𐁓𐁓𐁓	\BNlxx	𐁔𐁔𐁔𐁔	\BNcd	𐁖	\BNm
𐁑𐁑𐁑𐁑𐁑	\BNv	𐁓	\BNxx	𐁓𐁓𐁓𐁓𐁓	\BNlxxx	𐁔𐁔𐁔𐁔𐁔	\BNd		
𐁑𐁑𐁑𐁑𐁑𐁑	\BNvi	𐁓𐁓	\BNxxx	𐁓𐁓𐁓𐁓𐁓𐁓	\BNxc	𐁔𐁔𐁔𐁔𐁔𐁔	\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



𐁀	\BPtalent	𐁁	\BPvolb	𐁂	\BPvolcf	𐁃	\BPwtb	𐁄	\BPwtd
𐁅	\BPvola	𐁆	\BPvolcd	𐁇	\BPwta	𐁈	\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

	\BPamphora		\BPchassis		\BPman		\BPwheat
	\BParrow		\BPcloth		\BPnanny		\BPwheel
	\BPbarley		\BPcow		\BPolive		\BPwine
	\BPbilly		\BPcup		\BPox		\BPwineiih
	\BPboar		\BPewe		\BPpig		\BPwineiiih
	\BPbronze		\BPfoal		\BPram		\BPwineivh
	\BPbull		\BPgoat		\BPsheep		\BPwoman
	\BPcauldroni		\BPgoblet		\BPsow		\BPwool
	\BPcauldronii		\BPgold		\BPspear		
	\BPchariot		\BPhorse		\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

	\BUi		\BUiv		\BUvii		\BUx		\Btwe
	\BUii		\BUv		\BUviii		\BUxi		
	\BUiii		\BUvi		\BUix		\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		\Cku		\Cmu		\Cpo		\Cso		\Cwi
	\Ce		\Cla		\Cna		\Cpu		\Csu		\Cwo
	\Cga		\Cle		\Cne		\Cra		\Cta		\Cxa
	\Ci		\Cli		\Cni		\Cre		\Cte		\Cxe
	\Cja		\Clo		\Cno		\Cri		\Cti		\Cya
	\Cjo		\Clu		\Cnu		\Cro		\Cto		\Cyo
	\Cka		\Cma		\Co		\Cru		\Ctu		\Cza
	\Cke		\Cme		\Cpa		\Csa		\Cu		\Czo
	\Cki		\Cmi		\Cpe		\Cse		\Cwa		
	\Cko		\Cmo		\Cpi		\Csi		\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 "𐠄𐠊𐠎", for example. See the cypriot documentation for more information.

Table 279: sarabian South Arabian Letters

𐩲	\SAa	𐩸	\SAz	𐩣	\SAm	𐩺	\SAsd	𐩹	\SAdb
𐩨	\SAb	𐩢	\SAhd	𐩬	\SAn	𐩤	\SAq	𐩻	\SAtb
𐩴	\SAg	𐩷	\SAtd	𐩯	\SAs	𐩧	\SAr	𐩶	\SAga
𐩵	\SAd	𐩺	\SAy	𐩰	\SAf	𐩪	\SAsv	𐩺	\SAzd
𐩠	\SAh	𐩫	\SAk	𐩱	\SAlq	𐩩	\SAt	𐩼	\SAsa
𐩥	\SAw	𐩡	\SAl	𐩱	\SAo	𐩭	\SAhu	𐩽	\SAdd

These symbols must appear either within the argument to `\textsarab` or following the `\sarabfamily` font-selection command within a scope. Single-character shortcuts are also supported: Both "`\textsarab{\SAb\SAk\SAn}`" and "`\textsarab{bkn}`" produce "𐩨𐩫𐩬", for example. See the sarabian documentation for more information.

Table 280: teubner Archaic Greek Letters and Greek Numerals

𐩺	\Coppa†	F	\Digamma*	𐩦	\sampi*	𐩧	\varstigma
𐩻	\coppa†	𐩬	\koppa*	𐩧	\Stigma		
𐩹	\digamma*,‡	𐩯	\Sampi	𐩧	\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 `\koppa` 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

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

Table 282: wasysym General Symbols

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

Table 283: wasysym Circles

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

Table 284: wasysym Musical Symbols

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

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

Table 285: arev Musical Symbols

♩	\quarternote	♪	\eighthnote	♬	\sixteenthnote

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

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

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

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

The musixtex package must be installed to use harmony.

TABLE 288: manfnt Dangerous Bend Symbols

\dbend \lhdbend \reversedvideodbend

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

TABLE 289: Miscellaneous manfnt Symbols

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

TABLE 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		\FHBOlogo		\MartinVogel		\Womanface
	\Bouquet		\FHBOLOGO		\Mundus		\Yinyang
	\Celtcross		\Frowny	@	\MVAt		
Ⓐ	\CircledA		\FullFHBO	➔	\MVRightarrow		

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 ("𝔗"), \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	𝍸	\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: hhcount 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}	𝍸	\fcscore{3}	𝍻	\fcscore{5}
||	\fcscore{2}	𝍹	\fcscore{4}		

The \fcscore command accepts values larger than 5. For example, "\fcscore{47}" produces "𝍻𝍻𝍻𝍻𝍻𝍻𝍻𝍻𝍻𝍸𝍹".

TABLE 305: skull Symbols

	\skull

TABLE 306: Non-Mathematical mathabx Symbols

⸸	\rip

TABLE 307: skak Chess Informator Symbols

∓	\bbetter	♙♙	\doublepawns	○⋯○	\seppawns
−+	\bdecisive	⊥	\ending	O-O	\shortcastling
⌓	\betteris	=	\equal	⊕	\timelimit
⧉	\bishoppair	⇔	\file	∞	\unclear
∓	\bupperhand	»	\kside	○○	\unitedpawns
×	\capturesymbol	O-O-O	\longcastling	R	\various
O	\castlingchar	✕	\markera	±	\wbetter
-	\castlinghyphen	O	\markerb	+−	\wdecisive
⊞	\centre	#	\mate	⨯	\weakpt
+	\checksymbol	>	\morepawns	∟	\with
RR	\chesscomment	○	\moreroom	→	\withattack
‖	\chessetc	N	\novelty	△	\withidea
—	\chesssee	□	\onlymove	↑	\withinit
∞	\compensation	⧉	\opposbishops	⌋	\without
⇆	\counterplay	♙	\passedpawn	±	\wupperhand
↻	\devadvantage	«	\qside	⊙	\zugzwang
⇗	\diagonal	▞	\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 ❶, ❷, ❸, ... ⓽⓽ 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

×	\a	⏑́⏑	\bBm	‖	\cc	⏑́⏑	\Mbb	⁞	\Pppp	⊗	\t
⏑́	\B	⏑⏑	\bbm	‖‖	\Ccc	⏑⏑⏑	\mbbx	⁞	\pppp	⏓	\tsbm
⏑	\b	⏑́⏑	\Bbm	–	\m	∘∘	\oo	⁞	\Ppppp	⏔	\tsmb
⏑́⏑	\Bb	⏑⏑⏑	\bbmb	–́	\M	.	\p	⁞	\ppppp	⏓	\tsmm
⏑́⏑	\BB	⏑⏑⏑	\bbmx	⏓	\ma	⁘	\pm	⏓⏓	\ps	⁘	\vppm
⏑⏑	\bb	⏑⏑	\bm	⏑́	\Mb	:	\pp	:	\pxp	⁝	\vpppm
⏑́⏑	\bB	⏑́⏑	\Bm	⏑	\mb	:	\Pp	:	\Pxp	::	\x
⏑⏑	\bba	|	\c	⏑́⏑	\mBb	⁘	\ppm	∼	\R		
⏑⏑	\bbb	|	\C	⏑́⏑	\mbB	⁝	\ppp	∼	\r		
⏑́⏑	\BBm	‖	\Cc	⏑⏑	\mbb	⁝	\Ppp	⊗	\T		

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

Table 311: metre Small and Large Metrical Symbols

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

Table 312: teubner Metrical Symbols

∘∘	\aeolicbii	⏑	\barbrevis	⁺	\ipercatal
∘∘∘	\aeolicbiii	⏑⏑	\bbrevis	–	\longa
∘∘∘∘	\aeolicbiv	⏑	\brevis	⏑⏑	\ubarbbrevis
×	\anceps	⌃	\catal	⏑	\ubarbrevis
⏓	\ancepsdbrevis	⌒	\corona	⏑⏑	\ubarsbrevis
⏓	\banceps	⏑	\coronainv	⏑	\ubrevislonga
⏑⏑	\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 `\longa`s, two `\barbbrevis`es, four `\brevis`es, and a `\dBar` into "–⏑⏑–⏑⏑–||–⏑⏑–⏑⏑–". 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*

\Bart

\Homer

\Maggie

\SNPP

\Burns

\Lisa

\Marge

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

`\Left\Bart`

TABLE 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	╧	\textSFxlv	╛	\textSFxxviii
┌	\textSFi	┴	\textSFvii	╨	\textSFxlvi	╔	\textSFxxxix
└	\textSFii	├	\textSFviii	╤	\textSFxlvii	╞	\textSFxxxvi
┐	\textSFiii	─	\textSFx	╥	\textSFxlviii	╟	\textSFxxxvii
┘	\textSFiv	│	\textSFxi	╫	\textSFxx	╚	\textSFxxxviii
┤	\textSFix	╡	\textSFxix	╖	\textSFxxi	▒	\textshade
╘	\textSFl	╨	\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.galdrasyning.is/index.php?option=com_content&task=category&sectionid=5&id=18&Itemid=60` (TinyURL: `http://tinyurl.com/25979m`). For example, `\staveL` ("") is intended to ward off ghosts and evil spirits.

Table 317: pigpen Cipher Symbols

⌟	{\pigpenfont A}	⌟·	{\pigpenfont J}	V	{\pigpenfont S}
⌞	{\pigpenfont B}	⌞·	{\pigpenfont K}	>	{\pigpenfont T}
L	{\pigpenfont C}	L·	{\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}		

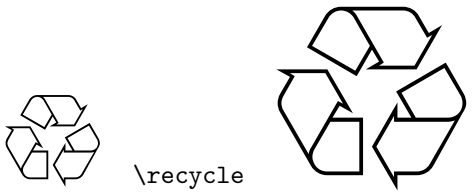
Table 318: GHiNA2e Phases of the Moon

	\MoonPha{1}		\MoonPha{2}		\MoonPha{3}		\MoonPha{4}

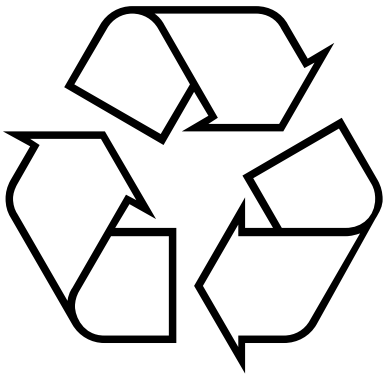
Table 319: Other GHiNA2e Symbols

	\Greenpoint		\Postbox		\Telephone
	\Info		\Request		

TABLE 320: recycle Recycling Symbols



\recycle \Recycle



\RECYCLE

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 LaTeX Symbol List. First, it draws attention to symbol names used by multiple packages. Next, it provides some guidelines for finding symbols and gives some examples regarding how to construct missing symbols out of existing ones. Then, it comments on the spacing surrounding symbols in math mode. After that, it presents an ASCII and Latin 1 quick-reference guide, showing how to enter all of the standard ASCII/Latin 1 symbols in LaTeX. And finally, it lists some statistics about this document itself.

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, LaTeX 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 LaTeX source for this document (`symbols.tex`) for examples of this and other techniques for handling symbol conflicts. Note that `symbols.tex`'s `\savesymbol` and `\restoresymbol` macros have been extracted into the savesym package, which can be downloaded from CTAN.

txfonts and pxfonts redefine a huge number of symbols—essentially, all of the symbols defined by latexsym, textcomp, the various $\mathcal{AMS}$ symbol sets, and LaTeX 2$_\varepsilon$ 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 LaTeX 2$_\varepsilon$'s `\fontsize` command. Because the symbols shown belong to the Computer Modern family, the type1cm package needs to be loaded to support font sizes larger than 24.88 pt.

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

All variable-sized delimiters are defined (by the corresponding `.tfm` file) in terms of up to five segments, as illustrated by Figure 1 on page 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	LaTeX 2ε	AMS	stmaryrd	wasysym	mathabx	marvosym	bbding	ifsym	dingbat	wsuipa
\baro			⌽							⊖
\bigtriangledown	▽		▽							
\bigtriangleup	△		△							
\checkmark		✓							✓	
\Circle				○				○		
\Cross						†	†	×		
\ggg		⋙			⋙					
\Letter						✉		✉		
\lightning			↯	↯						
\Lightning						↯				
\lll		⋘			⋘					
\Square				□			□	□		
\Sun					⊙	☉		☼		
\TriangleDown							▼	▽		
\TriangleUp							▲	△		

TABLE 322: Example of a Benign Name Clash

Symbol	Default (Computer Modern)	txfonts (Times Roman)
`R`	$\mathbb{R}$	$\mathbb{R}$
`\textrecipe`	℞	℞

TABLE 323: Sample resized delimiters

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

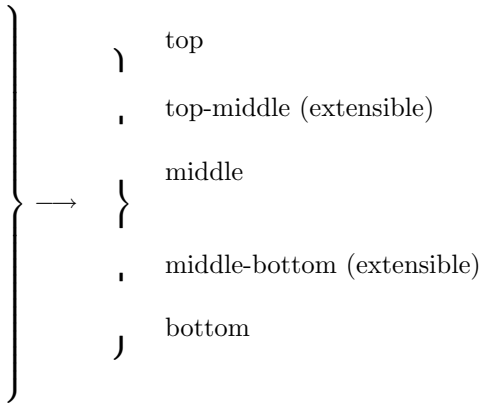


Figure 1: Implementation of variable-sized delimiters

- 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 LaTeX Symbol List, please send me e-mail at the address listed on the title page.
- The symbol isn't defined in any package whatsoever.

Even in the last case, all is not lost. Sometimes, a symbol exists in a font, but there is no LaTeX binding for it. For example, the PostScript Symbol font contains a "↵" symbol, which may be useful for representing a carriage return, but there is no package (as far as I know) for accessing that symbol. To produce an unnamed symbol, you need to switch to the font explicitly with LaTeX 2ε's low-level font commands [LAT00] and use TeX's primitive \char command [Knu86a] to request a specific character number in the font.[5] In fact, \char is not strictly necesssary; the character can often be entered symbolically. For example, the symbol for an impulse train or Tate-Shafarevich group ("Ш") is actually an uppercase *sha* in the Cyrillic alphabet. (Cyrillic is supported by the OT2 font encoding, for instance). While a *sha* can be defined numerically as "{\fontencoding{OT2}\selectfont\char88}" it may be more intuitive to use the OT2 font encoding's "SH" ligature: "{\fontencoding{OT2}\selectfont SH}".

Reflecting and rotating existing symbols

A common request on comp.text.tex is for a reversed or rotated version of an existing symbol. As a last resort, these effects can be achieved with the graphicx (or graphics) package's \reflectbox and \rotatebox macros. For example, \textsuperscript{\reflectbox{?}} produces an irony mark ("؟"; cf. http://en.wikipedia.org/wiki/Irony_mark), and \rotatebox[origin=c]{180}{ι} produces the definite-description operator ("℩"). The disadvantage of the graphicx/graphics approach is that not every TeX 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 \textrevepsilon ("ɜ") or wsuipa's \revepsilon ("ɜ") may be used to express the mathematical notion of "such that" in a cleaner manner than with \reflectbox or \rotatebox.[7]

Joining and overlapping existing symbols

Symbols that do not exist in any font can sometimes be fabricated out of existing symbols. The LaTeX 2ε 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 TeX primitive upon which LaTeX's \newcommand is based. See The TeXbook [Knu86a] for more information on all three of those commands.

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

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

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

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

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

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

[7] More 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 −9 mu kern would have produced the less-attractive "$\bar{d}$" glyph.

The amsmath package provides `\overset` and `\underset` commands for placing one symbol respectively above or below another. For example, `\overset{G}{\sim}`[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` ("⁂") from a June 2007 post to `comp.text.tex` by Peter Flynn:

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

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

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

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

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

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

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

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

A related LATEX command, borrowed from Plain TEX, is `\ooalign`. `\ooalign` vertically overlaps symbols and works both within and outside of math mode. Essentially, it creates a single-column `tabular` environment with zero vertical distance between rows. However, because it is based directly on TEX's `\ialign` primitive, `\ooalign` uses TEX's tabular syntax instead of LATEX's (i.e., with `\cr` as the row terminator instead of `\\`). The following example of `\ooalign`, a macro that defines a standard-state symbol (`\stst`, "⊖") as a superscripted Plimsoll line (`\barcirc`, "⊖"),[9] is due to an October 2007 `comp.text.tex` post by Donald Arseneau:

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

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

[9] While `\barcirc` illustrates how to combine symbols using `\ooalign`, the stmaryrd package's `\minuso` command (Table 46 on page 22) provides a similar glyph ("⊖") 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` ("∋") and two minus signs ("−") to produce "∋", an obscure variation on the infrequently used "ɜ" 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 "$\not{D}$". However, the `\declareslashed` command provides the flexibility to specify the mathematical context of the composite character (operator, relation, punctuation, etc., as will be discussed in Section 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 ("$\mathit{\not I}$"). This can be declared as follows:

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

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

Somewhat simpler than slashed is the centernot package. centernot provides a single command, `\centernot`, which, like `\not`, puts a slash over the subsequent mathematical symbol. However, instead of putting the slash at a fixed location, `\centernot` centers the slash over its argument. `\centernot` might be used, for example, to create a "does not imply" symbol:

$$\not\Longrightarrow \quad \texttt{\textbackslash not\textbackslash Longrightarrow}$$

vs.

$$\centernot\Longrightarrow \quad \texttt{\textbackslash centernot\textbackslash Longrightarrow}$$

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 "⊥" symbol out of `\top` and `\bot` ("⊤" and "⊥"):

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

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

```
\def\Xint#1{\mathchoice
   {\XXint\displaystyle\textstyle{#1}}%
   {\XXint\textstyle\scriptstyle{#1}}%
   {\XXint\scriptstyle\scriptscriptstyle{#1}}%
   {\XXint\scriptscriptstyle\scriptscriptstyle{#1}}%
```

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

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

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

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

Sometimes, however, amstext's `\text` macro is all that is necessary to make composite symbols appear correctly in subscripts and superscripts, as in the following definitions of `\neswarrow` ("$\swarrow$") and `\nwsearrow` ("$\nwarrow$"):[10]

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

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

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

[10] Note 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 LaTeX into accepting "`@`" as part of a macro name. `\moverlay` takes a list of symbols separated by `\cr` (TeX's equivalent of LaTeX's `\\`). For example, the `\topbot` command defined on page 105 could have been expressed as "`\moverlay{\top\cr\bot}`" and the `\neswarrow` 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 TeXbook [Knu86a] for explanations of the TeX primitives used by `\moverlay`.

Modifying LaTeX-generated symbols

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

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

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

Producing complex accents

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

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

Creating extensible symbols

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

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

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

If all that needs to extend are horizontal and vertical lines—as opposed to repeated symbols such as the "=" in the previous example—LATEX's `array` or `tabular` environments may suffice. Consider the following code (due to a February 1999 `comp.text.tex` post by Donald Arseneau 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{@{}>{\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{##\crcr\noalign{\kern3\p@}
      \downbracketfill\crcr\noalign{\kern3\p@\nointerlineskip}
      $\hfil\displaystyle{#1}\hfil$\crcr}}}\limits}
\def\underbracket#1{\mathop{\vtop{\ialign{##\crcr
      $\hfil\displaystyle{#1}\hfil$\crcr\noalign{\kern3\p@\nointerlineskip}
      \upbracketfill\crcr\noalign{\kern3\p@}}}}\limits}
\def\overparenthesis#1{\mathop{\vbox{\ialign{##\crcr\noalign{\kern3\p@}
      \downparenthfill\crcr\noalign{\kern3\p@\nointerlineskip}
      $\hfil\displaystyle{#1}\hfil$\crcr}}}\limits}
\def\underparenthesis#1{\mathop{\vtop{\ialign{##\crcr
      $\hfil\displaystyle{#1}\hfil$\crcr\noalign{\kern3\p@\nointerlineskip}
      \upparenthfill\crcr\noalign{\kern3\p@}}}}\limits}
\def\downparenthfill{$\m@th\braceld\leaders\vrule\hfill\bracerd$}
\def\upparenthfill{$\m@th\bracelu\leaders\vrule\hfill\braceru$}
\def\upbracketfill{$\m@th\makesm@sh{\llap{\vrule\@height3\p@\@width.7\p@}}%
  \leaders\vrule\@height.7\p@\hfill
  \makesm@sh{\rlap{\vrule\@height3\p@\@width.7\p@}}$}
\def\downbracketfill{$\m@th
  \makesm@sh{\llap{\vrule\@height.7\p@\@depth2.3\p@\@width.7\p@}}%
  \leaders\vrule\@height.7\p@\hfill
  \makesm@sh{\rlap{\vrule\@height.7\p@\@depth2.3\p@\@width.7\p@}}$}
\makeatother
```

Table 324 showcases these accents. The TEXbook [Knu86a] or another book on TEX primitives is indispensible for understanding how the preceding code works. The basic idea is that `\downparenthfill`, `\upparenthfill`, `\downbracketfill`, and `\upbracketfill` do all of the work; they output a left symbol (e.g., `\braceld` [“⎧”] for `\downparenthfill`), a horizontal rule that stretches as wide as possible, and a right symbol (e.g., `\bracerd` [“⎫”] for `\downparenthfill`). `\overbracket`, `\underbracket`, `\overparenthesis`, and `\underparenthesis` merely create a table whose width is determined by the given text, thereby constraining the width of the horizontal rules.

TABLE 324: Manually Composed Extensible Accents

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

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

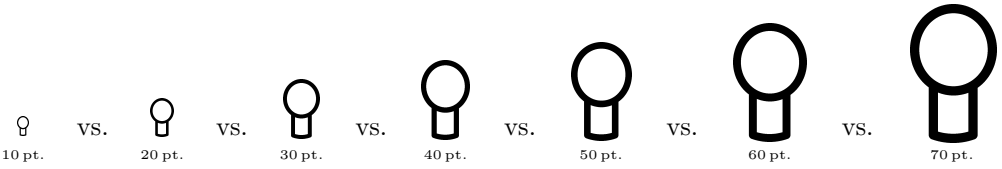
$$\acontraction{}{A}{B}{C}\acontraction[2ex]{A}{B}{C}{D}\bcontraction{}{A}{BC}{D}ABCD \quad .$$

See the simplewick documentation for more information.

Developing new symbols from scratch

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

Suppose we need a symbol to represent a light bulb (“💡”).[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.

[11] I'm not a very good artist; you'll have to pretend that “💡” 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);                           % z1 is at the top of a circle.
    rt z2 = (w + sb + o - x4, y4);                   % z2 is at the same height as z4 but the opposite side.
    bot z3 = (z1 - (0, w - sb - o));                 % z3 is at the bottom of the circle.
    lft z4 = (sb - o, 1/2[y1, y3]);                  % z4 is on the left of the circle.
    path bulb;                                       % Define a path for the bulb itself.
    bulb = z1 .. z2 .. z3 .. z4 .. cycle;            % The bulb is a closed path.

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

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

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

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

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

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

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

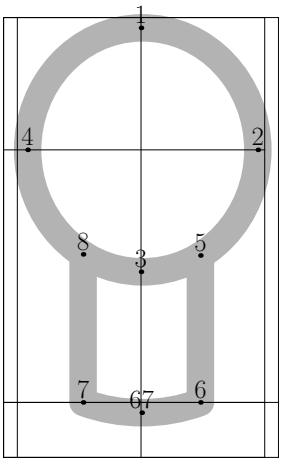


Figure 4: Proof diagram of `lightbulb10.mf`

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. LATEX 2_ε, however, needs more information before documents can use the font. First, we create a font-description file that tells LATEX 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 "LATEX 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 LATEX 2_ε request for a `U`-encoded version of `bulb` with a (`m`)edium font

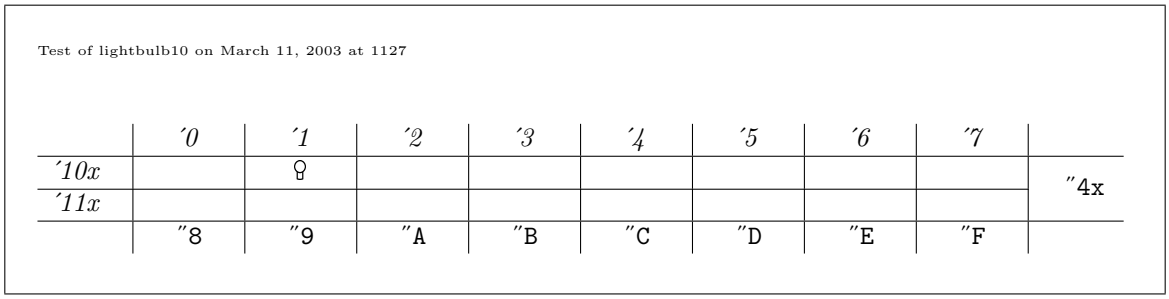


Figure 5: Font table produced by `testfont.tex`

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

Figure 6: LaTeX 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 TeX request for `lightbulb10.tfm` mechanically scaled to the current font size.

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

The purpose of the "log-like symbols" in 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 "$\max\limits_{p\in P}$" 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

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

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

It is common to use a thin space (`\,`) between the words of a multiword operators, as in "`\DeclareMathOperator*{\argmax}{arg\,max}`". `\liminf`, `\limsup`, and all of the log-like symbols shown in Table 129 utilize this spacing convention.

8.5 Bold mathematical symbols

LaTeX does not normally use bold symbols when typesetting mathematics. However, bold symbols are occasionally needed, for example when naming vectors. Any of the approaches described at `http://www.tex.ac.uk/cgi-bin/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	
none	`$\alpha + b = \Gamma \div D$`	$\alpha + b = \Gamma \div D$	(no bold)
none	`$\mathbf{\alpha + b = \Gamma \div D}$`	$\mathbf{\alpha + b = \Gamma \div D}$	
none	`\boldmath$\alpha + b = \Gamma \div D$`	$\boldsymbol{\alpha + b = \Gamma \div D}$	
amsbsy	`$\pmb{\alpha + b = \Gamma \div D}$`	$\boldsymbol{\alpha + b = \Gamma \div D}$	(faked bold)
amsbsy	`$\boldsymbol{\alpha + b = \Gamma \div D}$`	$\boldsymbol{\alpha + b = \Gamma \div D}$	
bm	`$\bm{\alpha + b = \Gamma \div D}$`	$\boldsymbol{\alpha + b = \Gamma \div D}$	
fixmath	`$\mathbold{\alpha + b = \Gamma \div D}$`	$\boldsymbol{\alpha + b = \Gamma \div D}$	

[12] Note 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 LaTeX 2ε typesetting of ASCII characters, i.e., the characters available on a typical U.S. computer keyboard. The first two columns list the character's ASCII code in decimal and hexadecimal. The third column shows what the character looks like. The fourth column lists the LaTeX 2ε command to typeset the character as a text character. And the fourth column lists the LaTeX 2ε command to typeset the character within a `\texttt{...}` command (or, more generally, when `\ttfamily` is in effect).

TABLE 328: LaTeX 2ε ASCII Table

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

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, “¡”, “¿”, and “—” 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 “<*filename*>”.

[13] Donald 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, LaTeX additionally defines a `\slash` command which outputs the same glyph but permits a line break afterwards. That is, "`increase/decrease`" is always typeset as a single entity while "`increase\slash{}decrease`" may be typeset with "increase/" on one line and "decrease" on the next.

- `\textasciicircum` can be used instead of `\^{}`, and `\textasciitilde` can be used instead of `\~{}`. Note that `\textasciitilde` and `\~{}` produce raised, diacritic tildes. "Text" (i.e., vertically centered) tildes can be generated with either the math-mode `\sim` command (shown in Table 67 on page 30), which produces a somewhat wide "∼", or the textcomp package's `\texttildelow` (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 TeX 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 "LaTeX 2_ε" columns work both in body text and within a `\texttt{...}` command (or, more generally, when `\ttfamily` is in effect).

- The "£" and "$" glyphs occupy the same slot (36) of the OT1 font encoding, with "£" appearing in italic fonts and "$" appearing in roman fonts. A problem with LaTeX's default handling of this double-mapping is that "`{\sffamily\slshape\pounds}`" produces "*$*", not "*£*". Other font encodings use separate slots for the two characters and are therefore robust to the problem of "£"/"$" conflicts. Authors who use `\pounds` should select a font encoding other than OT1 (as explained on page 8) or use the textcomp package, which redefines `\pounds` to use the TS1 font encoding.

- Character 173, `\-`, is shown as "-" but is actually a discretionary hyphen; it appears only at the end of a line.

Microsoft® Windows® normally uses a superset of Latin 1 called "Code Page 1252" or "CP1252" for short. CP1252 introduces symbols in the Latin 1 "invalid" range (characters 128–159). Table 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	
161	A1	¡	!‘	
162	A2	¢	\textcent	(tc)
163	A3	£	\pounds	
164	A4	¤	\textcurrency	(tc)
165	A5	¥	\textyen	(tc)
166	A6	¦	\textbrokenbar	(tc)
167	A7	§	\S	
168	A8	¨	\textasciidieresis	(tc)
169	A9	©	\textcopyright	
170	AA	ª	\textordfeminine	
171	AB	«	\guillemotleft	(T1)
172	AC	¬	\textlnot	(tc)
173	AD	-	\-	
174	AE	®	\textregistered	
175	AF	¯	\textasciimacron	(tc)
176	B0	°	\textdegree	(tc)
177	B1	±	\textpm	(tc)
178	B2	²	\texttwosuperior	(tc)
179	B3	³	\textthreesuperior	(tc)
180	B4	´	\textasciiacute	(tc)
181	B5	µ	\textmu	(tc)
182	B6	¶	\P	
183	B7	·	\textperiodcentered	
184	B8	¸	\c{}	
185	B9	¹	\textonesuperior	(tc)
186	BA	º	\textordmasculine	
187	BB	»	\guillemotright	(T1)
188	BC	¼	\textonequarter	(tc)
189	BD	½	\textonehalf	(tc)
190	BE	¾	\textthreequarters	(tc)
191	BF	¿	?‘	
192	C0	À	\‘{A}	
193	C1	Á	\’{A}	
194	C2	Â	\^{A}	
195	C3	Ã	\~{A}	
196	C4	Ä	\"{A}	
197	C5	Å	\AA	
198	C6	Æ	\AE	
199	C7	Ç	\c{C}	
200	C8	È	\‘{E}	
201	C9	É	\’{E}	
202	CA	Ê	\^{E}	
203	CB	Ë	\"{E}	
204	CC	Ì	\‘{I}	
205	CD	Í	\’{I}	
206	CE	Î	\^{I}	
207	CF	Ï	\"{I}	
208	D0	Đ	\DH	(T1)

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

TABLE 330: LaTeX 2ε Code Page 1252 Table

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

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

While too large to incorporate into this document, a listing of ISO 8879:1986 SGML/XML character entities and their LaTeX equivalents is available from `http://www.bitjungle.com/~isoent/`. Some of the characters presented there make use of isoent, a LaTeX 2ε package (available from the same URL) that fakes some of the missing ISO glyphs using the LaTeX `picture` environment.[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 TeX and LaTeX predate the Unicode standard and Unicode fonts by almost a decade, support for Unicode has had to be added to the base TeX and LaTeX systems. Note first that LaTeX 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 LaTeX to translate UTF-8 sequences to LaTeX 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 LaTeX command to execute when the corresponding Unicode character is encountered in the input. For example, the Unicode character "degree celsius" ("℃") 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 LaTeX 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.

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

[16] The 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℃.
\end{document}
```

which produces

> It was a balmy 21℃.

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 ("℣") and response ("℟") 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 "℣" for a versicle and "℟" 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 LaTeX
- tables showing how to typeset all of the characters in the ASCII and Latin 1 font encodings

Furthermore, the internal structure of the document has been completely altered from David 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 LaTeX couldn't find, but that `symbols.tex` otherwise would have been able to take advantage of. Complete, prebuilt versions of this document are available from CTAN (`http://www.ctan.org/` or one of its many mirror sites) in the directory `tex-archive/info/symbols/comprehensive`. Table 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:	`symbols.tex`
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 ulsy ar metre txfonts mathabx fclfont skak ascii dingbat skull eurosym esvect yfonts yhmath esint mathdots trsym universa upgreek overrightarrow chemarr chemarrow nath trfsigns mathtools phaistos arcs vietnam t4phonet holtpolt semtrans dictsym extarrows protosem harmony hieroglf cclicenses mathdesign arev MnSymbol cmll extpfeil keystroke fge turnstile simpsons epsdice feyn universal staves igo colonequals shuffle fourier dozenal pmboxdraw pigpen clock teubner linearA linearb cypriot sarabian china2e harpoon steinmetz milstd recycle DotArrow ushort hhcount ogonek combelow accents nicefrac bm mathrsfs chancery calligra bbold mbboard dsfont bbm
Packages omitted:	*none*

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
bbding	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
pmboxdraw	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

8.9 Copyright and license

The Comprehensive LaTeX Symbol List
Copyright © 2009, Scott Pakin

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`http://www.latex-project.org/lppl.txt`

and version 1.3c or later is part of all distributions of LaTeX version 2006/05/20 or later.

This work has the LPPL maintenance status "maintained".

The current maintainer of this work is Scott Pakin.

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[Knu86b] Donald E. Knuth. *The METAFONTbook*, volume C of *Computers and Typesetting*. Addison-Wesley, Reading, MA, USA, 1986.

[Lam86] Leslie Lamport. *LATEX: A document preparation system*. Addison-Wesley, Reading, MA, USA, 1986.

[LAT98] LATEX3 Project Team. A new math accent. *LATEX News*. Issue 9, June 1998. Available from `http://www.ctan.org/tex-archive/macros/latex/doc/ltnews09.pdf` (also included in many TEX distributions).

[LAT00] LATEX3 Project Team. LATEX 2_ε font selection, January 30, 2000. Available from `http://www.ctan.org/tex-archive/macros/latex/doc/fntguide.ps` (also included in many TEX distributions).

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., "◌́" for "`\'`").

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

Symbols

`\"` (◌̈) 14
`\#` (#) 9, 114
`\$` ($) 9, 114
`\%` (%) 9, 114
`\&` (&) 9, 114
`\'` (◌́) 14
`(` (() 54
`(` (() 55
`)` ()) 54
`)` ()) 55
`*` (*) 23
`\,` 113
`\-` (-) 115, 116
`\.` (◌̇) 14
`/` (/) 54
`/` (/) 55
`\:` (:) 64
`\;` (:) 64
`<` (<) 55
`\?` (?) 64
`[` ([) 54
`[` ([) 55
`\\` 104
`]` (]) 54
`]` (]) 55
`\^` (◌̂) 14
`\^{}` (^) 9, 115
`\|` (‖) 54
`\|` (‖) 54, 56
`\|` (◌̳) 14
`\=` (◌̄) 14
`\={}` (¯) 115
`|` (|) 55
`|` (|) 30, 54, 56, 57
`\_` (_) 9, 115
`\{` ({) 9, 54, 115
`\}` (}) 9, 54, 115
`\‘` (◌̀) 14
`\~` (◌̃) 14
`\~{}` (~) 9, 115

A

`a` (esvect package option) . . . 61
`\a` (×) 95
`\AA` (Å) 10
`\aa` (å) 10
`\AAaleph` (ᵸ) 81
`\AAayin` (ᵰ) 81
`\AAbeth` (ᵬ) 81
`\AAcht` (♫) 89
`\AAdaleth` (ᵭ) 81
`\AAhe` (ʰ) 81
`\AAhelmet` (ᵸ) 81
`\AAheth` (ʰ) 81
`\AAkaph` (ᵡ) 81
`\AAlamed` (ˡ) 81
`\Aaleph` (ᵅ) 81
`\AApe` (ᵖ) 81
`\AAqoph` (ᵠ) 81
`\AAresh` (ʳ) 81
`\AAsade` (ˢ) 81
`\Aayin` (ᵞ) 81
`\AAyod` (ʸ) 81
`\Abeth` (ᵇ) 81
absolute value . *see* `\lvert` *and* `\rvert`
abzüglich . . *see* `\textdiscount`
`\AC` (∼) 70
`\acarc` 16
`\acbar` 16
accents . . 14–18, 57–61, 71, 89, 107–109
  acute (◌́) 14–18, 57
  any character as 107
  arc (◌̑) 14–17, 59, 60
  breve (◌̆) 14–18, 57
  caron (◌̌) . . . 14, 18, 57, 60
  cedilla (◌̧) 14
  circumflex (◌̂) 14–16, 57, 59, 60
  comma-below (◌̦) 17
  diæresis (◌̈) 14, 17, 18, 57, 68
  dot (◌̇ or ◌̣) 14–16, 57
  double acute (◌̋) . . . 14, 18
  extensible 59–61, 63, 108–109
  grave (◌̀) 14–18, 57
  háček . . *see* accents, caron
  hook (◌̉) 14
  Hungarian umlaut . . . *see* accents, double acute
  kroužek . . *see* accents, ring
  macron (◌̄) . 14, 17, 18, 57, 59, 60
  multiple per character 15–16, 107
  ogonek (◌̨) 14–17
  ring (◌̊) . 14–16, 18, 57, 58
  Romanian comma-belo accent . . . . . *see* accents, comma-below
  trema *see* accents, diæresis
  umlaut *see* accents, diæresis
accents (package) . 58, 107, 119, 121
`\accentset` 107
`\Acht` (♪) 89
`\AchtBL` (♩) 89
`\AchtBR` (♩) 89
`\ACK` (♠) 72
`\acontraction` 109
`\AcPa` (ˀ) 89
`\actuarial` (◌) 108
actuarial symbols 108
`\acute` (◌́) 57
acute (◌́) . . . . . *see* accents
`\acutus` (◌́) 17
`\Adaleth` (ᵭ) 81
adeles (𝔸) . *see* alphabets, math
adjoint (†) . . . . . *see* `\dag`
Adobe Acrobat 112
`\adots` (⋰) 64, 107
advancing . *see* `\textadvancing`
`\AE` (Æ) 10
`\ae` (æ) 10
`\aeolicbii` (ꭎ) 95
`\aeolicbiii` (ꭏ) 95
`\aeolicbiv` (ꭐ) 95
`\agem0` (ʊ) 66
`\Agimel` (ᵞ) 81
`\Ahe` (ʰ) 81
`\Ahelmet` (ᵸ) 81
`\Aheth` (ʜ) 81
`\ain` (ʿ) 18
`\Akaph` (ᵡ) 81
`\Alad` (}) 57
`\alad` (}) 57
`\Alamed` (ˡ) 81
`\Alas` ({) 57
`\alas` ({) 57
`\aldine` (❧) 78
`\aldineleft` (❧) 78
`\aldineright` (❧) 78
`\aldinesmall` (❧) 78
`\aleph` (ℵ) 51, 65
`\aleph` (א) 51
`\Alif` (ʾ) 14
`\alpha` (α) 50
alphabets
  African 10

[17] This 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
\alphaup (α) 50
alpine symbols 91
\Alt (Alt) 72
alternative denial . *see* \uparrow *and* |
\AltGr (AltGr) 72
\amalg (II) 22
\amalg (⨿) 23
\Amem (⁓) 81
ampersand . . . . . *see* \&
$\mathcal{AMS}$. 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 (÷) 95
\anaclasis (÷) 95
\anceps (×) 95
\ancepsdbrevis (×̯) 95
\anchor (⚓) 80
ancient-language symbols 81–87
and . . . . . *see* \wedge
AND gates 73
\ANDd ( ) 73
\ANDl ( ) 73
\ANDr ( ) 73
\ANDu ( ) 73
\angle (∠) 66
\angle (∠) 65
\angle (∠) 66
angle notation 70
angles 65–67
\Anglesign (⦟) 67
Ångström unit
math mode *see* \mathring
text mode . . . . . *see* \AA
\Angud (⦡) 57
\angud (⦡) 57
angular minutes . . . . *see* \prime
angular seconds . . . *see* \second
\Angus (⦠) 57
\angus (⦠) 57
animals 81, 82, 86
\Ankh (☥) 90
annuity symbols 108
\Antidiple (≺) 95
\antidiple (≺) 95
\Antidiple* (⪡) 95
\antidiple* (⪡) 95
\antilabe (∷) 64
\Antisigma (⊃) 95
\antisigma (⊃) 95
\Anun (⅂) 81
\Ape (⅄) 81
APL
modifiers 71
symbols 71
\APLbox (□) 71
\APLcirc (∘) 71
\APLcomment (⍝) 71
\APLdown (∇) 71
\APLdownarrowbox (⍗) 71
\APLinput (⍞) 71
\APLinv (⌹) 71
\APLleftarrowbox (⍇) 71
\APLlog (⍟) 71
\APLminus (¯) 71
\APLnot (∼) 71
\APLrightarrowbox (⍈) 71
\APLstar (⋆) 71
\APLup (∆) 71
\APLuparrowbox (⍐) 71
\APLvert (∣) 71
\apprge (≳) 38
\apprle (≲) 38
\approx (≈) 30
\approx (≈) 32
\approxcolon (≈:) 36
\approxcoloncolon (≈::) . . . 36
\approxeq (≊) 30
\approxeq (≊) 32
\Aqoph (ᕴ) 81
\Aquarius (♒) 71
\aquarius (♒) 71
\AR ($\mathcal{R}$) 70
ar (package) 70, 119
arc (◠) . . . . . *see* accents
\arccos (arccos) 49
arcminutes . . . . . *see* \prime
arcs (package) 17, 119, 120
arcseconds . . . . . *see* \second
\arcsin (arcsin) 49
\arctan (arctan) 49
\Aresh (ᚱ) 81
arev (package) . 67, 88, 119, 120
\arg (arg) 49
\Aries (♈) 71
\Aries (♈) 71
\aries (♈) 71
\ArrowBoldDownRight (➥) . 75
\ArrowBoldRightCircled (➲) 75
\ArrowBoldRightShort (➧) . . 75
\ArrowBoldRightStrobe (➠) 75
\ArrowBoldUpRight (➦) . . . 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 (‖) 54
\Arrowvert (‖) 55
\arrowvert (∣) 54
\arrowvert (∣) 55
Arseneau, Donald 104, 106–108
\Asade (⅄) 81
\Asamekh (◇) 81
ASCII . . 8, 10, 72, 100, 114–115, 117, 119
table 114
ascii (package) 72, 115, 119, 120
\ascnode (☊) 71
\Ashin (ω) 81
aspect ratio 70
\ast (∗) 23
\ast (∗) 22
\ast (∗) 23
\Asteriscus (※) 95
\asteriscus (※) 95
\Asterisk (✳) 23
\Asterisk (✻) 78
\asterisk (∗) 23
\AsteriskBold (✱) 78
\AsteriskCenterOpen (✲) . . 78
\AsteriskRoundedEnds (✿) . 78
asterisks 23, 78
\AsteriskThin (✳) 78
\AsteriskThinCenterOpen (✳) 78
\asterism (⁂) 104
astrological symbols 71
astronomical symbols . . . 71, 98
\astrosun (☉) 71
\asymp (≍) 30
\asymp (≍) 48
\atan (atan) 113
\ataribox (🅐) 88
\Atav (+) 81
\Ateth (ᛞ) 81
\AtForty (🅐40) 90
\AtNinetyFive (🅐95) 90
atomic math objects . . 49, 113
\AtSixty (🅐60) 90

\autoleftarrow (⟵) . . . 62
\autoleftrightharpoons (⥊) 62
\autorightarrow (⟶) . . 62
\autorightleftharpoons (⥋) 62
\Avav (ʕ) 81
average 21
\Ayn (ʿ) 14
\Ayod (ﬡ) 81
\Azayin (=) 81

B

\B 10
\B (ↄ) 95
b (esvect package option) . . . 61
\b (◽) 14
\b (◡) 95
\Ba (ᚑ) 85
babel (package) 50, 87
\babygamma (ɤ) 13
\backapprox (≋) 32
\backapproxeq (≊) 32
\backcong (≌) 32
\backepsilon (϶) 30
\backeqsim (⋍) 32
\backneg (⌐) 66
\backprime (‵) 66
\backprime (‵) 66
\backsim (∽) 30
\backsim (∽) 32
\backsimeq (⋍) 30
\backsimeq (⋍) 32
\backslash (\) 54, 65
\backslash (⧵) 55
\backslashdiv (⨸) 23
\backtriplesim (⋒) 32
\Baii (ᚒ) 85
\Baiii (ᚓ) 85
banana brackets . . . . . . *see* \llparenthesis *and* \rrparenthesis
\banceps (x̄) 95
\bar (◾) 57
\barb (ƀ) 13
\barbbrevis (ᶀ) 95
\barbrevis (ᶀ) 95
\barcirc (⊖) 104
\bard (ƌ) 13
\bari (ɨ) 13
\barin (ɘ̄) 52
\barj (ɟ) 13
\barl (ɬ) 13
\barlambda (ƛ) 13
\barleftharpoon (⥫) 43
\baro (ɸ) 22
\baro (ɸ vs. ɵ) 101
\baro (ɵ) 13
\barp (ᵽ) 13
barred letters 104
\barrightharpoon (⥭) 43
\barsci (ɪ) 13
\barscu (ᵿ) 13
\Bart ( ) 96
\baru (ʉ) 13
\barwedge (⊼) 23
\barwedge (⊼) 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
\bauhead ( ) 90
\bauhole (●) 80
\bauplus (🟢) 90
\baupunct (●) 80
\bauquarter (◔) 90
\bauquestion (🎲) 90
\bausquare (■) 80
\bausquare (■) 80
\bautriangle (▲) 80
\bautriangle (▲) 80
\bauwhitearrow (⇨) 75
\bauwindow (⊞) 90
\BB (ᶀ) 95
\Bb (ᶀ) 95
\bB (ᶀ) 95
\bb (◡) 95
\bba (☆) 95
\bbalpha (ɑ) 68
\bbar (ƀ) 104
\bbb (ᵬ) 95
\bbbeta (β) 68
\Bbbk (𝕜) 52
bbding (package) 75–78, 80, 101, 119, 120
\bbdollar ($) 68
\bbetter (⁒) 93
\bbeuro (€) 68
\bbfinalnun (ﬗ) 68
\bbgamma (ɣ) 68
bbgreekl (mathbbol package option) 68
\BBm (ᶀ) 95
\Bbm (ᶀ) 95
\bBm (ᶀ) 95
bbm (package) 68, 119
\bbm (ᶀ) 95
\bbmb (ᶀ) 95
\bbmx (ᶀ) 95
\bbnabla (∇) 68
bbold (package) 68, 119
\bbpe (ᵬ) 68
\bbqof (ᵬ) 68
\bbrevis (◡) 95
\bbslash (⧵) 22
\bbyod (ᵬ) 68
\bcontraction 109
\Bda (ᚔ) 85
\Bde (ᚕ) 85
\bdecisive (−+) 93
\Bdi (ᚖ) 85
\Bdo (ᚗ) 85
\Bdu (ᚘ) 85
\Bdwe (ᚙ) 85
\Bdwo (ᚚ) 85
\Be (᚛) 85
\Beam (▬) 73
\Bearing (᚜) 73
\because (∵) 30, 64
\because (∵) 64
\BEL (•) 72
\bell (🔔) 88
Berry, Karl 122
\beta (β) 50
\betaup (β) 50
\beth (ℶ) 51
\beth (ב) 51
\betteris (◠) 93
\between (≬) 32
\between (≬) 30
\between (≬) 32
\Bi (᚝) 85
\bibridge (🌉) 16
biconditional . . . . . . *see* \leftrightarrow *and* \equiv
\Bicycle (🚲) 90
\Big 100, 102
\big 100, 102
big O (𝑂) . *see* alphabets, math
\bigast (∗) 23
\bigbosonloop ( ) 74
\bigbosonloopA ( ) 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
\bigboxslash (⨄) 26
\bigboxtimes (⨅) 26
\bigboxtop (⨆) 26
\bigboxtriangleup (⨃) . . . 26
\bigboxvoid (⨆) 27
\bigcap (⋂) 25
\bigcap (∩) 29
\bigcapdot (⩀) 29
\bigcapplus (⩁) 29
\bigcirc (◯) 22
\bigcirc (○) 79
\BigCircle (○) 79
\bigcircle (○) 29
\bigcoast (⊛) 23
\bigcomplementop (∁) 27
\BigCross (⨯) 79
\bigcup (⋃) 25
\bigcup (∪) 29
\bigcupdot (⊍) 29
\bigcupplus (⊎) 29
\bigcupplus (⊎) 29
\bigcurlyvee (⋎) 26
\bigcurlyvee (⋎) 26
\bigcurlyvee (⋎) 29
\bigcurlyveedot (⍲) 29
\bigcurlywedge (⋏) 26
\bigcurlywedge (⋏) 26
\bigcurlywedge (⋏) 29
\bigcurlywedgedot (⍭) 29
\BigDiamondshape (◇) 79
\bigdoublecurlyvee (⩔) . . . 29
\bigdoublecurlywedge (⩕) . 29
\bigdoublevee (⩒) 29
\bigdoublewedge (⩓) 29
\Bigg 100, 102
\bigg 100, 102
\BigHBar (⨪) 79
\biginterleave (⫼) 26
\BigLowerDiamond (⬙) 79
\bignplus (⨁) 26
\bigoast (⊛) 29
\bigoasterisk (⊛) 27
\bigobackslash (⦸) 27
\bigobackslash (⦸) 29
\bigobot (⦶) 27
\bigocirc (⦾) 27
\bigocirc (⊚) 29
\bigocoasterisk (⊛) 27
\bigodiv (⨀) 27
\bigodot (⨀) 25
\bigodot (⊙) 29
\bigoleft (⦵) 27
\bigominus (⨁) 27
\bigominus (⊖) 29
\bigoplus (⨁) 25
\bigoplus (⊕) 29
\bigoright (⦶) 26
\bigoslash (⦸) 26
\bigoslash (⊘) 29
\bigostar (⊛) 29
\bigotimes (⨂) 25
\bigotimes (⊗) 29
\bigotop (⦶) 26
\bigotriangle (⧋) 29
\bigotriangleup (⧊) 26
\bigovert (⦶) 29
\bigovoid (⦵) 27
\bigparallel (⫼) 26
\bigparr (⅋) 30
\bigplus (⨁) 27
\bigplus (⨁) 29
\BigRightDiamond (⬗) 79
\bigsqcap (⨅) 26
\bigsqcap (⨅) 26
\bigsqcap (⨅) 29
\bigsqcapdot (⨇) 29
\bigsqcapplus (⨈) 27
\bigsqcapplus (⨈) 29
\bigsqcup (⨆) 25
\bigsqcup (⨆) 29
\bigsqcupdot (⨃) 29
\bigsqcupplus (⨄) 27
\bigsqcupplus (⨄) 29
\BigSquare (□) 79
\bigsquplus (⨄) 27
\bigstar (★) 23
\bigstar (★) 66
\bigstar (★) 79
\bigtimes (×) 27
\bigtimes (×) 29
\BigTriangleDown (▽) 79
\bigtriangledown (▽) 26
\bigtriangledown (▽ vs. ▽) 101
\bigtriangledown (▽) 22
\bigtriangledown (▽) 40
\BigTriangleLeft (◁) 79
\BigTriangleRight (▷) . . . 79
\BigTriangleUp (△) 79
\bigtriangleup (△) 26
\bigtriangleup (△ vs. △) 101
\bigtriangleup (△) 22
\bigtriangleup (△) 40
\biguplus (⨄) 25
\biguplus (⨄) 29
\bigvarstar (★) 23
\BigVBar (∣) 79
\bigvee (⋁) 25
\bigvee (∨) 29
\bigveedot (⩒) 29
\bigwedge (⋀) 25
\bigwedge (∧) 29
\bigwedgedot (⩑) 29
\bigwith (&) 30
\binampersand (&) 22
binary operators 22–25
binary relations . . 30–32, 34–39, 47, 48
  negated 31–33
\bindnasrepma (⅋) 22
\Biohazard (☣) 74
biological symbols 74
birds 82
bishop 94
\bishoppair (⚇) 93
\Bja (⚌) 85
\Bje (⚍) 85
\Bjo (⚏) 85
\Bju (⚎) 85
\Bka (⚊) 85
\Bke (⚋) 85
\Bki (⚈) 85
\Bko (⚇) 85
\Bku (⚉) 85
\BlackBishopOnBlack ( ) 94
\BlackBishopOnWhite ( ) 94
blackboard bold *see* alphabets, math
\blackdiamond (⬥) 23
\BlackEmptySquare ( ) . 94
\BlackKingOnBlack ( ) . 94
\BlackKingOnWhite ( ) . 94
\BlackKnightOnBlack ( ) 94
\BlackKnightOnWhite ( ) 94
\blacklozenge (⧫) 66
\blacklozenge (⧫) 79
\BlackPawnOnBlack ( ) . 94
\BlackPawnOnWhite ( ) . 94
\BlackQueenOnBlack ( ) 94
\BlackQueenOnWhite ( ) 94
\BlackRookOnBlack ( ) . 94
\BlackRookOnWhite ( ) . 94
\blacksmiley (☻) 88
\blacksquare (■) 66
\blacksquare (■) 25
\blackstone 94
\blacktriangle (▲) 66
\blacktriangle (▲) 40
\blacktriangledown (▾) . . . 25
\blacktriangledown (▼) . . . 66
\blacktriangledown (▼) . . . 40
\blacktriangleleft (◂) . . . 25
\blacktriangleleft (◀) . . . 39
\blacktriangleleft (◀) . . . 40
\blacktriangleright (▸) . . 25
\blacktriangleright (▶) . . 39
\blacktriangleright (▶) . . 40
\blacktriangleup (▴) 25

blank . . . . . *see* \textblank
\Bleech (△) 90
\blitza () 21, 48
\blitzb () 48
\blitzc () 48
\blitzd ( ) 48
\blitze () 48
block-element symbols 97
\Bm ( ) 95
bm (package) 113, 119, 121
\bm 113
\bm ( ) 95
\Bma () 85
\Bme ( ) 85
\Bmi ( ) 85
\Bmo ( ) 85
\bmod 49
\Bmu ( ) 85
\Bna () 85
\BNc () 85
\BNcc ( ) 85
\BNccc ( ) 85
\BNcd ( ) 85
\BNcm ( ) 85
\BNd () 85
\BNdc ( ) 85
\BNdcc () 85
\BNdccc ( ) 85
\Bne ( ) 85
\BNi ( ) 85
\Bni () 85
\BNii ( ) 85
\BNiii () 85
\BNiv () 85
\BNix ( ) 85
\BNl ( ) 85
\BNlx ( ) 85
\BNlxx ( ) 85
\BNlxxx ( ) 85
\BNm ( ) 85
\Bno () 85
\Bnu ( ) 85
\BNv ( ) 85
\BNvi ( ) 85
\BNvii ( ) 85
\BNviii ( ) 85
\Bnwa () 85
\BNx () 85
\BNxc ( ) 85
\BNxl ( ) 85
\BNxx ( ) 85
\BNxxx () 85
\Bo ( ) 85
body-text symbols 9–20
bold symbols 113
\boldmath 113
\boldsymbol 113
\bomb () 91
Boolean domain (𝔹) . . . . . *see* alphabets, math
Boolean logic gates 73
born . . . . . *see* \textborn
bosons 74
\bot (⊥) 21, 51, 105
\bot (⊥) 52
\botdoteq (≒) 32
\Bouquet () 90
\Bowtie (⋈) 88
\bowtie (⋈) 30
\bowtie (⋈) 23, 24
\Box (□) 65
\Box (□) 66
\Box (□) 25
box-drawing symbols 97
\boxast (⊛) 22
\boxasterisk (⊛) 25
\boxbackslash (⧅) 25
\boxbackslash (⧅) 25
\boxbar (⊟) 22
\boxbot (⊡) 25
\boxbox (⧈) 22
\boxbox (⧈) 25
\boxbslash (⧅) 22
\boxcirc (⊚) 25
\boxcircle (⊚) 22
\boxcoasterisk (⊛) 25
\boxdiv (⊞) 25
\boxdot (⊡) 25
\boxdot (⊡) 22
\boxdot (⊡) 25
\boxdotLeft (⇐⊡) 42
\boxdotleft (←⊡) 42
\boxdotRight (⊡⇒) 42
\boxdotright (⊡→) 42
\boxempty (□) 22
\boxLeft (⇐□) 42
\boxleft (⊟) 25
\boxleft (←□) 42
\boxminus (⊟) 25
\boxminus (⊟) 22
\boxminus (⊟) 25
\boxplus (⊞) 25
\boxplus (⊞) 22
\boxplus (⊞) 25
\boxRight (□⇒) 42
\boxright (⊞) 25
\boxright (□→) 42
\boxslash (⧄) 25
\boxslash (⧄) 22
\boxslash (⧄) 25
\boxtimes (⊠) 25
\boxtimes (⊠) 22
\boxtimes (⊠) 25
\boxtop (⊤) 25
\boxtriangleup (△) 25
\boxvert (⊟) 25
\boxvoid (□) 25
\boy (♂) 71
\Bpa () 85
\Bpaiii () 85
\BPamphora () 86
\BParrow () 86
\BPbarley () 86
\BPbilly () 86
\BPboar () 86
\BPbronze () 86
\BPbull () 86
\BPcauldroni () 86
\BPcauldronii () 86
\BPchariot () 86
\BPchassis () 86
\BPcloth () 86
\BPcow () 86
\BPcup () 86
\Bpe () 85
\BPewe () 86
\BPfoal () 86
\BPgoat () 86
\BPgoblet () 86
\BPgold () 86
\BPhorse () 86
\Bpi () 85
\BPman () 86
\BPnanny () 86
\Bpo () 85
\BPolive () 86
\BPox () 86
\BPpig () 86
\BPram () 86
\BPsheep () 86
\BPsow () 86
\BPspear () 86
\BPsword () 86
\BPtalent () 85
\Bpte () 85
\Bpu () 85
\Bpuii () 85
\BPvola () 85
\BPvolb () 85
\BPvolcd () 85
\BPvolcf () 85
\BPwheat () 86
\BPwheel () 86
\BPwine () 86
\BPwineiih () 86
\BPwineiiih () 86
\BPwineivh () 86
\BPwoman () 86
\BPwool () 86

\BPwta (𐤈) 85
\BPwtb (𐤂) 85
\BPwtc (𐤄) 85
\BPwtd (𐤅) 85
\Bqa (𐤒) 85
\Bqe (𐤓) 85
\Bqi (𐤕) 85
\Bqo (𐤖) 85
\Bra (𐤉) 85
bra 54
\braceld (⎩) 109
\bracerd (⎭) 109
\bracevert (|) 54
\bracevert ( ) 55
brackets . . . . . *see* delimiters
\Braii (𐤗) 85
\Braiii (𐤙) 85
braket (package) 54
\Bre (𐤔) 85
\Break (Break) 72
\breve (◌̆) 57
\breve (◌̆) 17
breve (◌̆) . . . . . *see* accents
\brevis (⏑) 95
\Bri (𐤀) 85
\Bro (𐤓) 85
\Broii (𐤁) 85
\brokenvert (¦) 88
Bronger, Torsten 105
\Bru (𐤖) 85
\BS (▪) 72
\Bsa (𐤎) 85
\Bse (𐤌) 85
\BSEfree (℠) 74
\Bsi (𐤋) 85
\Bso (𐤍) 85
\BSpace ( ) 72
\Bsu (𐤐) 85
\Bswa (𐤑) 85
\Bswi (𐤒) 85
\Bta (𐤈) 85
\Btaii (𐤘) 85
\Bte (𐤅) 85
\Bti (𐤉) 85
\Bto (𐤕) 85
\Btu (𐤖) 85
\Btwe (𐤂) 86
\Btwo (𐤃) 85
\Bu (𐤆) 85
\BUFd ( ) 73
buffers 73
\BUFl ( ) 73
\BUFr ( ) 73
\BUFu ( ) 73
\BUi (𐤄) 86
\BUii (𐤅) 86
\BUiii (𐤆) 86
\BUiv (𐤇) 86
\BUix (𐤈) 86
\bullet (•) 22
\bullet (•) 23
bullseye . . . *see* \textbullseye
\Bumpedeq (≎) 32
\bumpedeq (≏) 32
\Bumpeq (≎) 30
\Bumpeq (≎) 33
\bumpeq (≏) 30
\bumpeq (≏) 33
\bupperhand (∓) 93
\Burns ( ) 96
\BusWidth (/) 73
\BUv (𐤊) 86
\BUvi (𐤋) 86
\BUvii (𐤌) 86
\BUviii (𐤍) 86
\BUx (𐤎) 86
\BUxi (𐤏) 86
\BUxii (𐤐) 86
\Bwa (𐤌) 85
\Bwe (𐤂) 85
\Bwi (𐤃) 85
\Bwo (𐤄) 85
\Bza (𐤆) 85
\Bze (𐤄) 85
\Bzo (𐤕) 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 (◌̌) . . . . . *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* \llparenthesis *and* \rrparenthesis
\cb (◌̧) 17
\Cc (‖) 95
\cc ( ) 19
\cc (‖) 95
\ccby ( ) 19
\Ccc (⫴) 95
cclicenses (package) 19, 119, 120
\ccnc ( ) 19
\ccnd ( ) 19
\ccsa ( ) 19
\cdot (·) 22, 104
\cdot (·) 23, 64
\cdotp (·) 63
\cdotp (·) 64
\cdots (⋯) 63
\Ce (⋇) 86
Cedi . *see* \textcolonmonetary
cedilla (◌̧) . . . . . *see* accents
celestial bodies 71, 98
\celsius (℃) 70
\Celtcross (✟) 90
\cent (¢) 18
\centerdot (▪) 23
\centerdot (▪) 22
centernot (package) 105
\centernot 105
centigrade . . . *see* \textcelsius
\centre (⊞) 93
cents . . . . . *see* \textcent
\CEsign (C€) 74
\Cga (♈) 86
chancery (package) 119
\changenotsign 32
\char 8, 103, 112, 115, 118
Charter (font) 18, 30
\check (◌̌) 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
\circledotleft . . . . . *see* \circleddotleft
\circledotright . . . . . *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
\circplus (⨣) 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 (⍉) 86
\CleaningA (Ⓐ) 90
\CleaningF (Ⓕ) 90
\CleaningFF (Ⓕ) 90
\CleaningP (Ⓟ) 90
\CleaningPP (Ⓟ) 90
\Cli (⍒) 86
\clickb (⊙) 13
\clickc (C) 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 (⍵) 13
\closedprec (≺) 33
\closedrevepsilon (϶) 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
\colonapprox (:≈) 36
\colonapprox (:≈) 34
\colonapprox (:≈) 31
\coloncolon (::) 36
\coloncolonapprox (::≈) . . . 36
\coloncolonequals (::=) . . . 36
\coloncolonminus (::−) 36
\coloncolonsim (::∼) 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 (C) 29
complete shuffle product (⧢) 24
\COMPLEX (C) 49
\Complex (ℂ) 49

complex numbers (ℂ) .... *see* alphabets, math
composited 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 (≅) 30
\cong (≅) 33
congruent ..... *see* \equiv
\conjunction (⋏) 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* \nleftarrow *and* \nsubset
\convolution (∗) 23
\Coppa (Ϙ) 87
\coppa (ϙ) 87
\coprod (∐) 21, 25
\coprod (⨿) 29
copyright 9, 19, 116
\copyright (©) 9
\corner (⌜) 18
corners, box 97
\corona (⌢) 95
\coronainv (⌣) 95
\Corresponds (≙) 67
\corresponds (≙) 32
\cos (cos) 49, 113
\cosh (cosh) 49
\cot (cot) 49
\coth (coth) 49
\counterplay (⇆) 93
Courier (font) 18
CP1252 .... *see* code page 1252
CP437 ..... *see* code page 437
\Cpa (ǂ) 86
\Cpe (ʢ) 86
\Cpi (ᾼ) 86
\Cpo (ʃ) 86
\Cpu (ᾯ) 86
\CR (♪) 72
\cr 104
\Cra (Ⱥ) 86
\Cre (⩛) 86
Creative Commons licenses . 19
crescent (fge package option) 58
\Cri (Ὰ) 86
\Cro (Ⱦ) 86
\Cross (╳) 79
\Cross (✝ vs. ✝ vs. ╳) 101
\Cross (✝) 76
\Cross (✝) 90
cross ratio ... *see* \textrecipe
\crossb (ƀ) 13
\CrossBoldOutline (✟) 76
\CrossClowerTips (✣) 76
\crossd (đ) 13
\Crossedbox (🗵) 90
crosses 76, 77, 90, 94
\crossh (ħ) 13
\CrossMaltese (✠) 76
\crossnilambda (ƛ) 13
\CrossOpenShadow (✞) 76
\CrossOutline (✝) 76
crotchet .. *see* musical symbols
\crtilde (◌́) 16
\Cru (⩕) 86
crucifixes 76, 77, 90
\Crux (†) 57
\crux (†) 57
\Csa (⋁) 86
\csc (csc) 49
\Cse (⩅) 86
\cshuffle (⧢) 24
\Csi (⩟) 86
\Cso (⩾) 86
\Csu (⩏) 86
\Cta (⊢) 86
CTAN *see* Comprehensive TEX Archive Network
\Cte (⩡) 86
\Cti (⩠) 86
\Cto (⩤) 86
\Ctrl (Ctrl) 72
\Ctu (⩦) 86
\Cu (⩔) 86
\Cube (⚀ ⚁ ⚂ ⚃ ⚄ ⚅) 92, 103
cube root ..... *see* \sqrt
\Cup (⋓) 22
\Cup (⋓) 24
\cup (∪) 23
\cup (∪) 22, 104, 112
\cup (∪) 24
\cupdot (⊍) 24
\cupplus (⊎) 24
\curlyc (ɕ) 13
\curlyeqprec (⋞) 32
\curlyeqprec (⋞) 30
\curlyeqprec (⋞) 33
\curlyeqsucc (⋟) 32
\curlyeqsucc (⋟) 30
\curlyeqsucc (⋟) 33
\curlyesh (ʃ) 13
\curlyvee (⋎) 23
\curlyvee (⋎) 22
\curlyvee (⋎) 24
\curlyveedot (⋎) 24
\curlyveedownarrow (⋎) ... 22
\curlyveeuparrow (⋎) 22
\curlywedge (⋏) 23
\curlywedge (⋏) 22
\curlywedge (⋏) 24
\curlywedgedot (⋏) 24
\curlywedgedownarrow (⋏) . 22
\curlywedgeuparrow (⋏) ... 22
\curlyyogh (ʒ) 13
\curlyz (ƶ) 13
\currency (¤) 18
currency symbols 18, 19, 68
\curvearrowbotleft (⤿) .. 42
\curvearrowbotleftright (↭) 42
\curvearrowbotright (⤾) .. 42
\curvearrowdownup (⥿) 43
\curvearrowleft (↶) 42
\curvearrowleft (↶) 41
\curvearrowleft (↶) 44
\curvearrowleftright (↭) . 42
\curvearrowleftright (↭) . 43
\curvearrownesw (⤢) 43
\curvearrownwse (⤡) 43
\curvearrowright (↷) 42
\curvearrowright (↷) 41
\curvearrowright (↷) 44
\curvearrowrightleft (⇌) . 43
\curvearrowsenw (⤡) 43
\curvearrowswne (⤢) 43
\curvearrowupdown (⥾) 43
\Cutleft (≻) 75
\Cutline (---) 75
cutoff subtraction . *see* \dotdiv
\Cutright (≺) 75
\Cwa (⩒) 86
\Cwe (⩑) 86
\Cwi (⩓) 86
\Cwo (⩍) 86
\Cxa (⩗) 86
\Cxe (⩖) 86
\Cya (⩐) 86
\Cyo (⩘) 86
\cyprfamily 86
Cypriot 86
cypriot (package) .. 86, 119, 121
\Cza (⩓) 86
\Czo (⩔) 86

D

\D (◌̈) 17
d (esvect package option) ... 61
\d (◌̣) 14
\dag (†) 9, 117
\dagger (†) 22
\daleth (ℸ) 51
\daleth (ך) 51
\danger (⚠) 91
dangerous bend symbols ... 89
\DArrow (⇓) 72
\dasharrow ..... *see* \dashrightarrow
\dasheddownarrow (⇣) 43

\dashedleftarrow (⇠) 43
\dashednearrow (⇗) 43
\dashednwarrow (⇖) 43
\dashedrightarrow (⇢) 43
\dashedsearrow (⇘) 43
\dashedswarrow (⇙) 43
\dasheduparrow (⇡) 43
\dashint (⨍) 106
\dashleftarrow (⇠) 41
\dashleftarrow (⇠) 44
\dashleftrightarrow (⇢) . . 42
\dashrightarrow (⇢) 41
\dashrightarrow (⇢) 44
\DashV (⫤) 32
\Dashv (⫤) 32
\dashv (⊣) 30
\dashv (⊣) 33
\dashVv (⫣) 32
\davidsstar (✡) 77
\DavidStar (✡) 78
\DavidStarSolid (✸) 78
\dBar (⫡) 95
\dbar (đ) 104
\dbend (⸚) 89
dblaccnt (package) 107
\dblcolon (::) 34
\DCa (◂) 72
\DCb (↕) 72
\DCc (‼) 72
\DCd (¶) 72
\DD (ⅅ) 89
\ddag (‡) 9, 117
\ddagger (‡) 22
\ddashint (⨎) 106
\ddddot (⃜) 58
\dddot (⃛) 58
\dddtstile (⫣) 35
\ddigamma (ϝ) 87
\DDohne (ⅅ̸) 89
\ddot (¨) 57
\ddotdot (⸬) 24, 64
\ddots (⋰) 63, 107
\ddots (⋱) 64
\ddststile (⫣) 35
\ddtstile (⫣) 35
\ddttstile (⫣) 35
\DeclareFontFamily 111
\DeclareFontShape 111
\DeclareMathOperator . . . 113
\DeclareMathOperator* . . 113
\declareslashed 105
\DeclareUnicodeCharacter 117
\decofourleft (ᔕ) 78
\decofourright (ᔓ) 78
\decoone (ᔥ) 78
\decosix (✧) 78
\decothreeleft (ᔐ) 78
\decothreeright (ᔒ) 78
\decotwo (❦) 78
definite-description operator (℩) 103
definition symbols 21, 108
\deg (deg) 49
\degree (°) 66
\degree (°) 70
degrees . . . . . *see* \textdegree
\DEL (⌂) 72
\Del (Del) 72
\Deleatur . . . . . *see* \Denarius
delimiters 53–57
text-mode 57
variable-sized 54–57
wavy-line 55, 56
\Delta (Δ) 50
\delta (δ) 50
\deltaup (δ) 50
demisemiquaver . . . *see* musical symbols
\Denarius (𐆖) 18
\denarius (⛌) 19
\dental (̪) 16
derivitive, partial . *see* \partial
\descnode (ᘐ) 71
\det (det) 49
\devadvantage (◌꙰) 93
\Dfourier (⤷○) 36
\dfourier (○⤳) 36
\DFT (⟊) 63
\dft (⊢⟊) 63
\DH (Ð) 13
\DH (Ð) 10, 116
\dh (ð) 13
\dh (ð) 10, 116
diacritics . . . . . *see* accents
\diaeresis (¨) 17
diæresis (¨) . . . . . *see* accents
\diagdown (╲) 66
\diagdown (╲) 66
\diagdown (╲) 33
\diagonal (⧸) 93
\diagup (╱) 66
\diagup (╱) 66
\diagup (⁄) 33
\diameter (⌀) 66
\diameter (⌀) 21
\diameter (⌀) 66
\diameter (⌀) 88
\Diamond (◇) 65
\Diamond (◇) 66
\Diamond (◇) 25
\diamond (⋄) 22
\diamond (⋄) 25
\diamondbackslash (⟐) 25
\Diamondblack (◆) 66
\diamonddiamond (⟐) 25
\Diamonddot (⟐) 66
\diamonddot (⟐) 25
\DiamonddotLeft (⇔⟐) 42
\Diamonddotleft (⇔⟐) 42
\DiamonddotRight (⟐⇔) 42
\Diamonddotright (⟐→) 42
\diamonddots (∷) 24, 64
\DiamondLeft (⇔◇) 42
\Diamondleft (⇔◇) 42
\diamondminus (⟠) 25
\diamondplus (⨁) 25
\DiamondRight (◇⇔) 42
\Diamondright (◇→) 42
diamonds 79–80
diamonds (suit) 65–67, 80
\DiamondShadowA (🔷) 79
\DiamondShadowB (🔷) 79
\DiamondShadowC (🔷) 79
\Diamondshape (◇) 79
\diamondslash (⟐) 25
\DiamondSolid (◆) 80
\diamondsuit (♢) 65
\diamondsuit (♢) 66
\diamondtimes (⨳) 25
\diamondvert (⨷) 25
\diatop 18, 107
\diaunder 18, 107
dice 92, 103
dictionary symbols . . . 11–14, 96
dictsym (package) . 96, 119, 120
died . . . . . *see* \textdied
differential, inexact . *see* \dbar
\Digamma (F) 87
\digamma (ϝ) 50, 87
\digamma (ϝ) 87
digital logic gates 73
digits 65
LCD 70
Mayan 65
old-style 20
segmented 70
\dim (dim) 49
\ding 10, 75–78, 80
dingautolist 77
dingbat (package) . . 76, 80, 101, 119, 120
dingbat symbols 75–80
\Diple (⟩) 95
\diple (⟩) 95
\Diple* (⪢) 95
\diple* (⪢) 95
Dirac notation 54
discount . . . *see* \textdiscount
discretionary hyphen 115
disjoint union 21
disjunction . . . . . *see* \vee
\displaystyle . . 105, 106, 108, 113
ditto marks . *see* \textquotedbl
\div (÷) 22
\div (÷) 24
\divdot (⨪) 23
\divideontimes (⋇) 23
\divideontimes (⋇) 22
\divides (∣) 32
\divides (⁄) 33
division 22, 59
non-commutative 63

division times . . . . . *see* \divideontimes
divorced . . . *see* \textdivorced
\DJ (Đ) 10
\dj (đ) 10
\dlbari (ɨ) 13
\DLE (►) 72
\dlsh (↲) 42
\dndtstile (⫤) 35
\dnststile (⫢) 35
\dntstile (⫣) 35
\dnttstile (⫥) 35
do not enter . . . . . *see* \noway
does not divide . . . . *see* \nmid
does not exist . . . *see* \nexists
does not imply 105
\Dohne (⦱) 89
dollar . . . . . *see* \textdollar
dollar sign . . . . . *see* \$
\Dontwash (🚱) 90
\dot (◌̇) 57
dot accent (◌̇ or ◌̣) . *see* accents
dot symbols 9, 63, 64, 107
DotArrow (package) 63, 119, 121
\dotarrow (⇢) 63
\dotcup (⊍) 21, 104
\dotdiv (∸) 23
\Doteq . . . . . *see* \doteqdot
\Doteq (≑) 33
\doteq (≐) 30
\doteq (≐) 33
\doteqdot (≑) 30
\doteqdot (≑) 33
dotless *j* (*ȷ*)
text mode 14
dotless *i* (*ı*)
math mode 57, 65
text mode 14
dotless *j* (*ȷ*)
math mode 57, 65
\dotmedvert (∣) 24
\dotminus (∸) 24
\dotplus (∔) 23
\dotplus (∔) 22
\dots (. . .) 9, 117
dots (ellipses) . . . 9, 63–65, 107
\dotsb (· · ·) 64
\dotsc (. . .) 64
\dotseq (≑) 32
\dotsi (· · ·) 64
\dotsint (∫···∫) 28
\dotsm (· · ·) 64
\dotso (. . .) 64
dotted arrows 63
dotted union (⊍) 112
\dottedtilde (◌̤̃) 16
\dottimes (⨰) 23
\double 56, 57
double acute (◌̋) . . *see* accents
\doublebarwedge (⩞) 23
\doublebarwedge (⩞) 22
\doublecap . . . . . *see* \Cap
\doublecap (⩊) 23
\doublecap (⩊) 24
\doublecup . . . . . *see* \Cup
\doublecup (⩊) 23
\doublecup (⩊) 24
\doublecurlyvee (⋎) 24
\doublecurlywedge (⋏) 24
\doublefrown (⩒) 48
\doublefrowneq (⩓) 48
\doublepawns (♙) 93
\doublesmile (⩔) 48
\doublesmileeq (⩕) 48
\doublesqcap (⩎) 24
\doublesqcup (⩏) 23
\doubletilde (◌̃) 16
\doublevee (⩒) 23
\doublewedge (⩓) 23
\DOWNarrow (▼) 88
\Downarrow (⇓) 41, 54
\Downarrow (⇓) 43
\downarrow 112
\downarrow (↓) 41, 54
\downarrow (↓) 43
\downarrowtail (↣) 43
\downbracketfill 109
\downdownarrows (⇊) 42
\downdownarrows (⇊) 41
\downdownarrows (⇊) 43
\downdownharpoons (⥯) 43
Downes, Michael J. . . . 49, 122
\downfilledspoon (⥥) 47
\downfootline (⎍) 33
\downfree (⍗) 33
\downharpoonccw (⇃) 46
\downharpooncw (⇂) 46
\downharpoonleft (⇃) 43
\downharpoonleft (⇃) 41
\downharpoonright (⇂) 43
\downharpoonright (⇂) 41
\downlsquigarrow (⇟) 43
\downmapsto (↧) 43
\downModels (⫡) 33
\downmodels (⫡) 33
\downp (˯) 18
\downparenthfill 109
\downpitchfork (⫛) 47
\downpropto (∝) 33
\downrsquigarrow (⇜) 43
\downslice (▽) 25
\downspoon (⥥) 47
\downt (⊤) 18
\downtherefore (∵) . . . 23, 64
\downtouparrow (⥯) 42
\downuparrows (⇵) 42
\downuparrows (⇵) 43
\downupharpoons (⥮) 43
\downupharpoons (⥮) 46
\downVdash (⫧) 33
\downvdash (⊤) 33
\downY (⍑) 23
dozenal (package) 65, 119
dozenal digits 65
\dracma (⊢) 19
\drsh (↳) 42
\DS (Ꞩ) 89
\Ds (ꞩ) 89
\dsaeronautical (𝈘) 96
\dsagricultural (𝈙) 96
\dsarchitectural (𝈚) 96
\dsbiological (𝈛) 96
\dschemical (𝈜) 96
\dscommercial (𝈝) 96
\dsdtstile (⫦) 35
dsfont (package) 68, 119
\dsheraldical (𝈞) 96
\dsjuridical (𝈟) 96
\dsliterary (𝈠) 96
\dsmathematical (𝈡) 96
\dsmedical (𝈢) 96
\dsmilitary (𝈣) 96
\dsrailways (𝈤) 96
\dsststile (⫧) 35
\dstechnical (𝈥) 96
\dststile (⫨) 35
\dsttstile (⫩) 35
\dtdtstile (⫪) 35
\dtimes (⨴) 24
\dtimes (⨴) 23
\dtststile (⫫) 35
\dttstile (⫬) 35
\dtttstile (⫭) 35
duodecimal (base-12) digits . 65
DVI 19, 72, 111
\dz (ʤ) 13

E

e (esvect package option) . . . 61
\e (e) 52
\e (Ɛ) 65
ε-TEX 54
\Earth (⊕) 71
\Earth (♁) 71
\earth (♁) 71
\Ecommerce (🄯) 18
\EightAsterisk (✻) 78
\EightFlowerPetal (❁) . . . 78
\EightFlowerPetalRemoved (✼) 78
eighth note *see* musical symbols
\eighthnote (♪) 88
\eighthnote (♪) 88
\EightStar (✷) 78
\EightStarBold (✸) 78
\EightStarConvex (✹) 78
\EightStarTaper (✶) 78
\ejective (ʔ) 13
electrical symbols 70
electromotive force (ℰ) . . . . *see* alphabets, math
element of . . . . . *see* \in

\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 (ɱ) 13
\emptyset (∅) 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
\epsilonup (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
\eqslantless (⪕) 39
\eqsmile (≃) 48
\equal (=) 32
\equal (=) 93
\equalclosed (⧦) 32
\equalscolon (=:) 36
\equalscoloncolon (=::) . . . 36
\equalsfill 21, 108
equidecomposable 104
equilibrium . . . . . *see* \rightleftharpoons
\equiv (≡) 21, 30
\equiv (≡) 32
equivalence . . . . . *see* \equiv, \leftrightarrow, *and* \threesim
\equivclosed (⧦) 32
\er (ɚ) 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* \nleftrightarrow \nequiv, *and* \oplus
exclusive or 103
\exists (∃) 52
\exists (∃) 51
\exists (∃) 52
\exp (exp) 49
\Explosionsafe (㊮) 74
extarrows (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 (FAX) 73
\fax (℻) 73
\Faxmachine (🖷) 73
fc (package) 10, 14
\fcdice (⚀⚁⚂⚃⚄⚅) 92
fclfont (package) 119
\fcscore (𝍠 𝍡 𝍢 𝍣) 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 notation 105
Feynman-diagram symbols . . 74
\feyn{a} (a) 74
\feyn{c} (c) 74
\feyn{fd} (fd) 74
\feyn{flS} (flS) 74
\feyn{fl} (fl) 74
\feyn{fs} (fs) 74
\feyn{fu} (fu) 74
\feyn{fv} (fv) 74
\feyn{f} (f) 74
\feyn{g1} (g1) 74
\feyn{gd} (gd) 74
\feyn{glB} (glB) 74
\feyn{glS} (glS) 74
\feyn{glu} (glu) 74
\feyn{gl} (gl) 74
\feyn{gu} (gu) 74
\feyn{gvs} (gvs) 74
\feyn{gv} (gv) 74
\feyn{g} (g) 74
\feyn{hd} (hd) 74
\feyn{hs} (hs) 74
\feyn{hu} (hu) 74
\feyn{h} (h) 74
\feyn{ms} (ms) 74
\feyn{m} (m) 74
\feyn{P} (P) 74

\feyn{p} (ℊ) 74
\feyn{x} (ℵ) 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 (𝑝) 53
\fgee (∋) 53
\fgeeszett (g) 53
\fgeeta (ℷ) 53
\fgeF (Ⅎ) 53
\fgef (ℱ) 53
\fgeinfty (⧜) 67
\fgelangle (⦡) 67
\fgelb 53
\fgelb (ℷ) 53
\fgeleftB (⩋) 53
\fgeleftC (⊃) 53
\fgeN (ℷ) 53
\fgeoverU (ℷ) 53
\fgerightarrow (⤖) 47
\fgerightB (⩌) 53
\fges (f) 53
\fgestruckone (1) 65
\fgestruckzero (0) 65
\fgeU (⅄) 53
\fgeuparrow (⇑) 47
\fgeupbracket (⎵) 67
\FHBOLOGO (FHBO) 90
\FHBOlogo (FHBO) 90
field (𝔽) . . *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 (𝔽) . . *see* alphabets, math
\finpartvoice (◛) 16
\finpartvoiceless (◛) 16
\fint (⨍) 27
\fint (⨍) 28
\Finv (Ⅎ) 52
\Finv (Ⅎ) 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 (ɾ) 13
\flapr (ɾ) 13
\flat (♭) 65, 88
\flat (♭) 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

\fontsize 100, 102
fontspec (package) 118
\Football (⚽) 90
\forall (∀) 51
\forall (∀) 52
\Force (🡻) 73
\Forward (▶) 90
\ForwardToEnd (⏭) 90
\ForwardToIndex (⏩) 90
\FourAsterisk (✢) 78
\FourClowerOpen (❀) 78
\FourClowerSolid (🍀) 78
\Fourier (—○) 36
fourier (package) 19, 36, 51, 53, 57, 60, 76, 78, 91, 119
\fourier (○—) 36
Fourier transform (ℱ) . . . . *see* alphabets, math
\FourStar (✦) 78
\FourStarOpen (✧) 78
\fourth (⅏) 66
fractions 67
fraktur . . . *see* alphabets, math
Freemason's cipher 98
Frege logic symbols 47, 53, 65, 67
\frown (⌒) 30
\frown (⌢) 48
frown symbols 48
\frowneq (≓) 48
\frowneqsmile (≒) 48
\frownie (☹) 88
\frownsmile (≍) 48
\frownsmileeq (≒) 48
\Frowny (☹) 90
frowny faces 72, 88, 90, 91
\FS (└) 72
\FullFHBO (🈷) 90
\fullmoon (○) 71
\fullmoon (○) 71
\fullnote (𝅗𝅥) 88

G

\G (◌̆) 14
g (esvect package option) . . . 61
\Game (Ⅎ) 52
\Game (Ⅎ) 52
\Gamma (Γ) 50
\gamma (γ) 50
\gammaup (γ) 50
\Ganz (ᵒ) 89
\GaPa (▬) 89
Garamond (font) 18, 30
\gcd (gcd) 49
\ge . . . . . *see* \geq
\Gemini (♊) 71
\Gemini (♊) 71
\gemini (♊) 71
genealogical symbols 88
\geneuro (€) 19
\geneuronarrow (€) 19
\geneurowide (€) 19
gensymb (package) 70
\Gentsroom (🕴) 90
geometric shapes 78–80, 94
\geq (≥) 38
\geq (≥) 37, 38
\geq (≥) 39
\geqclosed (≥) 39, 40
\geqdot (⩾) 39
\geqq (≧) 38
\geqq (≧) 38
\geqq (≧) 39
\geqslant (⩾) 38
\geqslant (⩾) 39
\geqslantdot (⪀) 39
german (keystroke package option) 72
\gets . . . . . *see* \leftarrow
\gg (≫) 38
\gg (⋙) 37
\gg (≫) 39
\ggcurly (⪢) 32
\ggg (⋙) 38
\ggg (⋙) 38
\ggg (⋙ vs. ≫) 101
\ggg (⋙) 39
\gggtr . . . . . *see* \ggg
\gggtr (⋙) 39
ghosts 98
Gibbons, Jeremy 122
\gimel (ℷ) 51
\gimel (ג) 51
\girl (♀) 71
globe 90
\glotstop (ʔ) 13
\glottal (ʔ) 13
\gluon (ᵔᵔᵔᵔᵔᵔ) 70
gluons 74
\gnapprox (⪊) 38
\gnapprox (⪊) 38
\gnapprox (⪊) 39
\gneq (⪈) 38
\gneq (⪈) 38
\gneqq (≩) 38
\gneqq (≩) 38
\gneqq (≩) 39
\gnsim (⋧) 38
\gnsim (⋧) 38
\gnsim (⋧) 39
Go boards 94
Go stones 94
goban 94
\Goofy 96
graphics (package) 47, 103
graphicx (package) . 17, 100, 103
\grave (◌̀) 57
grave (◌̀) . . . . . *see* accents
\gravis (◌̀) 17
greater-than signs . . . . . *see* inequalities
greatest lower bound *see* \sqcap
Greek 50, 51
blackboard bold 68
bold 50, 113
polytonic 50
upright 50, 51
greek (babel package option) 50, 87
Greek coins 19
\Greenpoint (☯) 98
Gregorio, Enrico 104, 105
\grimace (☹) 91
\GS (↔) 72
\gtr (>) 39
\gtrapprox (⪆) 38
\gtrapprox (⪆) 38
\gtrapprox (⪆) 39
\gtrclosed (⋭) 39, 40
\gtrdot (⋗) 38
\gtrdot (⋗) 38
\gtrdot (⋗) 39
\gtreqless (⋚) 38
\gtreqless (⋚) 38
\gtreqless (⋚) 39
\gtreqlessslant (⪌) 39
\gtreqqless (⪌) 38
\gtreqqless (⪌) 38
\gtreqqless (⪌) 39
\gtrless (≷) 38
\gtrless (≷) 38
\gtrless (≷) 39
\gtrneqqless (⪌) 39
\gtrsim (≳) 38
\gtrsim (≳) 38
\gtrsim (≳) 39
\guillemotleft («) . . . 10, 116
\guillemotright (») . . 10, 116
\guilsinglleft (‹) . . . 10, 117
\guilsinglright (›) . . 10, 117
\gvcropped (↝) 74
\gvertneqq (≩) 38
\gvertneqq (≩) 38
\gvertneqq (≩) 39

H

\H (◌̋) 14
h (esvect package option) . . . 61
\h (◌̉) 14
\HA (ـــ) 82
\Ha (◌̈) 82
háček (◌̌) . . . . . *see* accents
\Hail (∴) 91
\Halb (𝅗𝅥) 89
half note . . *see* musical symbols
\HalfCircleLeft (◖) 80
\HalfCircleRight (◗) 80
\HalfFilledHut (⌂) 91
\halflength (ʻ) 18
\halfnote (𝅗𝅥) 88
\HalfSun (☼) 91
Hamiltonian (ℋ) *see* alphabets, math
\HandCuffLeft (☜) 76
\HandCuffLeftUp (☜) 76

\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 (ĥ) 57
\hateq (≐) 32
\hausaB (Ɓ) 13
\hausab (ɓ) 13
\hausaD (Ɗ) 13
\hausad (ɗ) 13
\hausaK (Ƙ) 13
\hausak (ƙ) 13
\HB (𐤁) 82
\Hb (𐤁) 82
\HBar (¯) 79
\hbar (ħ) 51, 52, 103
\hbipropto (∝) 23
\HC (𐤂) 82
\Hc (𐤂) 82
\hcrossing (⨯) 33
\HCthousand (𐤂) 82
\HD (𐤃) 82
\Hd (𐤃) 82
\hdotdot (‥) 23, 64
\hdots (⋯) 64
\Hdual (𐤍) 82
\HE (𐤄) 82
\He (𐤄) 82
heads . . . . . *see* faces
\Heart (♡) 90
hearts (suit) 65–67, 80
\heartsuit (♡) 65
\heartsuit (♡) 66
Hebrew 51, 68
Helvetica (font) 18
\hemiobelion (ⅽ) 19
\HERMAPHRODITE (⚥) 74
\Hermaphrodite (⚥) 74
\hexagon (⬡) 78
\Hexasteel (⬢) 73
\hexstar (✶) 77
\HF (F) 70
\HF (𐤆) 82
\Hf (𐤆) 82
\hfermion (ⱶ) 74
\hfil 105
\HG (𐤇) 82
\Hg (𐤇) 82
\HH 89
\HH (𐤇) 82
\Hh (𐤇) 82
hhcount (package) . 92, 119, 121
\Hhundred (𐤒) 82
\HI (𐤉) 82
\Hi (𐤉) 82
\hiatus (ᴴ) 95
\Hibl (𐤉) 82
\Hibp (𐤉) 82
\Hibs (𐤉) 82
\Hibw (𐤉) 82
hieroglf (package) . 82, 119, 120
hieroglyphics 82
Hilbert space (ℋ) *see* alphabets, math
\hill (▒) 16
\HJ (𐤉) 82
\Hj (𐤉) 82
\HK (𐤊) 82
\Hk (𐤊) 82
\hksqrt (√▒) 106
\HL (𐤋) 82
\Hl (𐤋) 82
\HM (𐤌) 82
\Hm (𐤌) 82
\Hman (𐤌) 82
\Hmillion (𐤌) 82
\Hms (𐤌) 82
\HN (𐤍) 82
\Hn (𐤍) 82
\HO (𐤏) 82
\Ho (𐤏) 82
Holt, Alexander 1, 118
\holter (▒) 63
holtpolt (package) 63, 119
\hom (hom) 49
\Home (Home) 72
\Homer ( ) 96
\Hone (𐤉) 82
hook accent (▒) . . . *see* accents
\hookb (ɓ) 13
\hookd (ɗ) 13
\hookd (ɗ) 13
\hookdownminus (⌐) 66
\hookg (ɠ) 13
\hookh (ɦ) 13
\hookheng (ɧ) 13
\hookleftarrow (↩) 41
\hookleftarrow (↩) 44
\hookrevepsilon (ɜ) 13
\hookrightarrow (↪) 41
\hookrightarrow (↪) 44
\hookupminus (⌙) 66
Horn, Berthold 69
\HP (𐤐) 82
\Hp (𐤐) 82
\Hplural (𐤉𐤉𐤉) 82
\Hplus (𐤕) 82
\HQ (𐤒) 82
\Hq (𐤒) 82
\Hquery (𐤉) 82
\HR (𐤓) 82
\Hr (𐤓) 82
\HS (𐤎) 82
\Hs (𐤎) 82
\Hscribe (𐤎) 82
\Hslash (𐤉) 82
\hslash (ħ) 52
\Hsv (𐤔) 82
\HT (𐤕) 82
\HT (○) 72
\Ht (𐤕) 82
\Hten (𐤉) 82
\Hthousand (𐤀) 82
\Htongue (𐤕) 82
\HU (𐤅) 82
\Hu (𐤅) 82
Hungarian umlaut (▒) *see* accents
\Hut (𐤄) 91
\HV (𐤅) 82
\Hv (𐤅) 82
\hv (ɦ) 13
\Hvbar (𐤅) 82
\HW (𐤅) 82
\Hw (𐤅) 82
\HX (𐤇) 82
\Hx (𐤇) 82
\HXthousand (𐤇) 82
\HY (𐤉) 82
\Hy (𐤉) 82
hyphen, discretionary 115
\HZ (𐤆) 82
\Hz (𐤆) 82

I

i̇ 14
\i (ı) 14
\ialign 104, 106, 108
\ibar (ɨ) 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
\iiiint (⨌) 26
\iiiint (⨊) 27
\iiiint (⨋) 28
\iiiint (⨋) 29
\iiint (∭) 27
\iiint (∭) 26
\iiint (∭) 26, 27
\iiint (∭) 28
\iiint (∭) 29
\iint (∬) 27
\iint (∬) 26
\iint (∬) 26, 28
\iint (∬) 28
\iint (∬) 29
\Im (ℑ) 51
\im (j) 52
\imath (ı) 51, 57
\impliedby *see* \Longleftarrow
\implies *see* \Longrightarrow *and* \vdash
impulse train . . . . . *see* sha
\in (∈) 52
\in (∈) 51
\in (∈) 52
\in (∈) 52
inches . . . . . *see* \second *and* \textquotedbl
\incoh (≍) 36
independence
  probabilistic 106
  statistical 106
  stochastic . . . . . *see* \bot
\independent (⫫) 106
\Industry (🏭) 90
inequalities 9, 37–39
inexact differential . . *see* \dbar
\inf (inf) 49
infimum . *see* \inf and \sqcap
infinity (∞) . . . . . *see* \infty
\Info (🛈) 98
\Info (🛈) 90
information symbols 90
informator symbols 93
\infty (∞) 66
\infty (∞) 65
\infty (∞) 66
\inipartvoice (◌̟) 16
\inipartvoiceless (◌̥) 16
\injlim (inj lim) 49
\inplus (⟌) 31
inputenc (package) 117
\Ins (Ins) 72
\int (∫) 27
\int (∫) 25, 26
\int (∫) 26
\int (∫) 29
\intclockwise (∱) 30
\INTEGER (𝕫) 49
\Integer (ℤ) 49
integers (ℤ) *see* alphabets, math
integrals . . . 25–30, 66, 105–106
integrals (wasysym package option) 26
\intercal (⊺) 22
\intercal (⊺) 52
\interleave (⫴) 22
intersection . . . . . *see* \cap
\Interval (🕓) 91
\inva (ɐ) 13
\invamp (⅋) 23
\invbackneg (⌙) 66
\INVd ( ) 73
\invdiameter (⌀) 88
\inve (ə) 13
inverse limit . *see* \varprojlim
\InversTransformHoriz (⊷) 36
\InversTransformVert (⥯) . 36
inverted symbols 11–13, 17, 103
inverters 73
\invf (ʇ) 13
\invglotstop (ʖ) 13
\invh (ɥ) 13
\INVl ( ) 73
\invlegr (ɹ) 13
\invm (ɯ) 13
\invneg (⌐) 31
\invneg (⌐) 66
\INVr ( ) 73
\invr (ɹ) 13
\invscr (ʁ) 13
\invscripta (ɒ) 13
\INVu ( ) 73
\invv (ʌ) 13
\invw (ʍ) 13
\invy (ʎ) 13
\iota (ι) 50
iota, upside-down 103
\iotaup (ι) 50
\ipagamma (ɣ) 13
\ipercatal (⁺) 95
\IroningI (🏧) 90
\IroningII (🏧) 90
\IroningIII (🏧) 90
irony mark (؟) 103
irrational numbers (𝕀) . . . . *see* alphabets, math
\Irritant (✕) 92
\ismodeledby (⥏) 103
ISO character entities 117
isoent (package) 117

J

\j (j) 14
\JackStar (✣) 78
\JackStarBold (✤) 78
Jewish star 77, 78
\jmath (𝚥) 51, 57
\Joch (ℿ) 91
\Join (⋈) 30, 31
\Join (⋈) 24
\joinrel 103
joint denial . . . *see* \downarrow
junicode (package) 118
Junicode-Regular.ttf (file) 118
\Jupiter (♃) 71
\Jupiter (♃) 71
\jupiter (♃) 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 (Ϙ) 87
\koppa (ϟ) 87
\Kr (◌⃝) 89
\kreuz (✠) 88
Kronecker product . *see* \otimes
Kronecker sum . . . . *see* \oplus
kroužek (◌̊) . . . . . *see* accents
\kside (≫) 93
\Kutline (┈) 75

L

\L (Ł) 10
\l (ł) 10
\labdentalnas (ɱ) 13
\labvel 16
\Ladiesroom (🚺) 90
Lagrangian ($\mathscr{L}$) . *see* alphabets, math
\Lambda (Λ) 50
\lambda (λ) 50
\lambdabar (ƛ) 66
\lambdaslash (ƛ) 66

\lambdaup (λ) 50
Lamport, Leslie 118, 122
\land . . . . . *see* \wedge
\landdownint (⨏) 28
\landdownint (⨍) 29
\landupint (⨎) 28
\landupint (⨍) 29
\Langle (⪡) 68
\lAngle (⟪) 56
\langle (⟨) 21, 54
\langle (⎛) 55
\langlebar (⎜) 55
\Laplace (•—○) 36
\laplace (○—•) 36
Laplace transform (ℒ) . . . . *see* alphabets, math
Laplacian (Δ) . . . . . *see* \Delta
Laplacian (∇^2) . . . . *see* \nabla
\largecircle (◯) 79
\largediamond (◇) 79
\largelozenge (◊) 79
\largepencil (✎) 76
\largepentagram (✯) 79
\largesquare (□) 79
\largestar (☆) 79
\largestarofdavid (✡) . . . 79
\largetriangledown (▽) . . 40
\largetriangleleft (◁) . . 40
\largetriangleright (▷) . 40
\largetriangleup (△) 40
\LArrow (⇦) 72
\larrowfill 62
\Laserbeam (✷—) 74
LaTeX . . 1, 8, 14, 26, 30, 49, 54, 63, 65, 73, 75, 100, 103–109, 112, 113, 115, 117–119, 121, 122
LaTeX 2ε 1, 8, 9, 19, 20, 22, 30, 36, 41, 58, 63, 65, 69, 73, 100, 101, 103, 106, 107, 111, 112, 114–117, 122
latexsym (package) 22, 30, 36, 41, 65, 100, 119
\latfric (ɬ) 13
Latin 1 . . . . . 8, 115, 119
table 116
laundry symbols 90
\Lbag (⟅) 53
\lbag (⟅) 53
\lbrace (⎧) 55
\Lbrack (⟦) 68
\lBrack (⟦) 56
LCD digits 70
\lCeil (⟮) 56
\lceil (⌈) 54
\lceil (⎡) 55
\lcirclearrowdown (⟲) . . . 43
\lcirclearrowleft (⟲) . . . 43
\lcirclearrowright (⟳) . . 43
\lcirclearrowup (⟲) 43
\lcircleleftint (⨑) 29
\lcirclerightint (⨑) 29
\lcm (lcm) 113
\lcorners (⌞) 53
\lcurvearrowdown (⤵) 43
\lcurvearrowleft (↶) 43
\lcurvearrowne (↱) 43
\lcurvearrownw (↰) 43
\lcurvearrowright (↝) 43
\lcurvearrowse (↘) 43
\lcurvearrowsw (↙) 43
\lcurvearrowup (↰) 43
\ldbrack (⟦) 55
\ldotp (.) 63
\ldots (. . .) 63
\le . . . . . *see* \leq
\leadsto (⇝) 31, 41
\leadsto (⇝) 44
leaf . . . . . *see* \textleaf
\leafleft (◒) 78
\leafNE (◪) 78
\leafright (◓) 78
leaves 78, 80
Lefschetz motive (ℒ) . . . . . *see* alphabets, math
\Left 96
\left 54, 56, 100, 102
\LEFTarrow (◀) 88
\Leftarrow (⇐) 21, 41
\Leftarrow (⇐) 43
\leftarrow (←) 42
\leftarrow (←) 41
\leftarrow (←) 44
\leftarrowtail (↢) 41
\leftarrowtail (↢) 44
\leftarrowtriangle (⇽) . . 42
\leftbarharpoon (⥢) 43
\LEFTCIRCLE (◖) 88
\LEFTcircle (◐) 88
\Leftcircle (◖) 88
\leftevaw (⦚) 56
\leftfilledspoon (•⟜) 47
\leftfootline (⊢) 33
\leftfree (⊢) 33
\lefthalfcap (⌜) 23
\lefthalfcup (⌞) 24
\lefthand (☜) 76
\leftharpoonccw (↼) 46
\leftharpooncw (↼) 46
\leftharpoondown (↽) 43
\leftharpoondown (↽) 41
\leftharpoonup (↼) 43
\leftharpoonup (↼) 41
\leftleftarrows (⇇) 42
\leftleftarrows (⇇) 41
\leftleftarrows (⇇) 44
\leftleftharpoons (⥪) . . . 43
\leftlsquigarrow (↜) 44
\leftmapsto (↤) 44
\leftModels (⫤) 33
\leftmodels (⫣) 33
\leftmoon (☾) 71
\leftmoon (☾) 71
\leftp (˂) 18
\leftpitchfork (⋔) 47
\leftpointright (☞) 76
\leftpropto (∝) 33
\Leftrightarrow (⇔) 41
\Leftrightarrow (⇔) 44
\leftrightarrow (↔) 42
\leftrightarrow (↔) 41
\leftrightarrow (↔) 44
\leftrightarroweq (⇿) 42
\leftrightarrows (⇆) 42
\leftrightarrows (⇆) 41
\leftrightarrows (⇆) 44
\leftrightarrowtriangle (⇹) 42
\leftrightharpoon (↔) . . . 43
\leftrightharpoondownup (↔) 46
\leftrightharpoons (⇋) . . 43
\leftrightharpoons (⇋) . . 41
\leftrightharpoons (⇋) . . . 46
\leftrightharpoonsfill . . . 62
\leftrightharpoonupdown (↔) 46
\Leftrightline (═) 33
\leftrightline (—) 33
\leftrightsquigarrow (↭) 42
\leftrightsquigarrow (↭) 41
\leftrightsquigarrow (↭) . 44
\leftrsquigarrow (↜) 44
\Leftscissors (⥸) 75
\leftslice (◅) 22
\leftslice (◅) 33
\leftspoon (⟜) 47
\leftsquigarrow (⇜) 42
\leftsquigarrow (⇜) 42
\leftt (⊣) 18
\leftthereforе (∵) . . . 24, 64
\leftthreetimes (⋋) 66
\leftthreetimes (⋋) 22
\leftthreetimes (⋋) 24
\leftthumbsdown (☟) 76
\leftthumbsup (☝) 76
\lefttorightarrow (⮌) . . . 42
\Lefttorque (ʅ) 73
\leftturn (↺) 88
\leftVdash (⫤) 33
\leftvdash (⊣) 33
\leftwave (⦙) 56
\leftY (⅄) 24
legal symbols 9, 19, 116
\legm (ɯ) 13
\legr (ɾ) 13

\length (:) 18
\Leo (ᘓ) 71
\leo (ᘏ) 71
\leq (⩽) 38
\leq (≤) 37, 38
\leq (≤) 39
\leqclosed (⊴) 39, 40
\leqdot (⩿) 39
\leqq (≦) 38
\leqq (≦) 38
\leqq (≦) 39
\leqslant (⩽) 38
\leqslant (⩽) 39
\leqslantdot (⩿) 39
\less (<) 39
less-than signs . . *see* inequalities
\lessapprox (⪅) 38
\lessapprox (≲) 38
\lessapprox (⪅) 39
\lessclosed (⊲) 39, 40
\lessdot (⋖) 38
\lessdot (⋖) 38
\lessdot (⋖) 39
\lesseqgtr (⋚) 38
\lesseqgtr (≶) 38
\lesseqgtr (⋚) 39
\lesseqgtrslant (⪏) 39
\lesseqqgtr (⪋) 38
\lesseqqgtr (≶) 38
\lesseqqgtr (⪋) 39
\lessgtr (≶) 38
\lessgtr (≶) 38
\lessgtr (≶) 39
\lessneqqgtr (≨) 39
\lesssim (≲) 38
\lesssim (≲) 38
\lesssim (≲) 39
\Letter (⌧) 92
\Letter (✉ vs. ⌧) 101
\Letter (✉) 73
letter-like symbols 51–53
letters . . . . . *see* alphabets
barred 104
non-ASCII 10
slashed 105
variant Latin 51
\levaw ( ) 56
\LF (◙) 72
\lfilet ( ) 55
\lFloor (⦋) 56
\lfloor (⌊) 54
\lfloor ( ) 55
\lg (lg) 49
\lgroup ( ) 54
\lgroup ( ) 55
\LHD (◀) 23
\lhd (◁) 22, 23
\lhd (◁) 39, 40
\lhdbend ( ) 89
\lhookdownarrow (↓) 44
\lhookleftarrow (↩) 44
\lhooknearrow (↗) 44
\lhooknwarrow (↖) 44
\lhookrightarrow (↪) 44
\lhooksearrow (↘) 44
\lhookswarrow (↙) 44
\lhookuparrow (↑) 44
\Libra (♎) 71
\libra (♎) 71
Lie derivative (ℒ) *see* alphabets, math
life-insurance symbols 108
\lightbulb (💡) 112
lightbulb.mf (file) . . . 109–111
lightbulb.sty (file) 112
lightbulb10.2602gf (file) . 111
lightbulb10.dvi (file) . . . 111
lightbulb10.mf (file) . 109–111
lightbulb10.tfm (file) . . . 112
\Lightning (🗲 vs. 🗲) 101
\Lightning (🗲) 91
\Lightning (🗲) 73
\lightning (🗲) 42
\lightning (🗲 vs. ϟ) 101
\lightning (🗲) 44
\lightning (ϟ) 88
\lim (lim) 49, 113
\liminf (lim inf) 49, 113
limits 49
\limsup (lim sup) 49, 113
\linbfamily 85, 86
Linear A 82
Linear B 85, 86
linear implication *see* \multimap
linear logic symbols . 21–23, 25, 29–30, 36, 51, 52
linearA (package) . . 82, 119, 121
\LinearAC (𐘀) 82
\LinearACC (𐘁) 82
\LinearACCC (𐘂) 82
\LinearACCCI (𐘃) 82
\LinearACCCII (𐘄) 82
\LinearACCCIII (𐘅) 82
\LinearACCCIV (𐘆) 82
\LinearACCCIX (𐘇) 83
\LinearACCCL (𐘈) 83
\LinearACCCLI (𐘉) 83
\LinearACCCLII (𐘊) 83
\LinearACCCLIII (𐘋) 83
\LinearACCCLIV (𐘌) 83
\LinearACCCLIX (𐘍) 83
\LinearACCCLV (𐘎) 83
\LinearACCCLVI (𐘏) 83
\LinearACCCLVII (𐘐) 83
\LinearACCCLVIII (𐘑) 83
\LinearACCCLX (𐘒) 84
\LinearACCCLXI (𐘓) 84
\LinearACCCLXII (𐘔) 84
\LinearACCCLXIII (𐘕) 84
\LinearACCCLXIV (𐘖) 84
\LinearACCCLXIX (𐘗) 84
\LinearACCCLXV (𐘘) 84
\LinearACCCLXVI (𐘙) 84
\LinearACCCLXVII (𐘚) 84
\LinearACCCLXVIII (𐘛) 84
\LinearACCCLXX (𐘜) 84
\LinearACCCLXXI (𐘝) 84
\LinearACCCLXXII (𐘞) 84
\LinearACCCLXXIII (𐘟) . . . 84
\LinearACCCLXXIV (𐘠) 84
\LinearACCCLXXIX (𐘡) 84
\LinearACCCLXXV (𐘢) 84
\LinearACCCLXXVI (𐘣) 84
\LinearACCCLXXVII (𐘤) 84
\LinearACCCLXXVIII (𐘥) . . . 84
\LinearACCCLXXX (𐘦) 84
\LinearACCCLXXXI (𐘧) 84
\LinearACCCLXXXII (𐘨) 84
\LinearACCCLXXXIII (𐘩) . . . 84
\LinearACCCLXXXIV (𐘪) . . . 84
\LinearACCCLXXXIX (𐘫) . . . 84
\LinearACCCLXXXV (𐘬) 84
\LinearACCCLXXXVI (𐘭) 84
\LinearACCCLXXXVII (𐘮) . . . 84
\LinearACCCLXXXVIII (𐘯) . . 84
\LinearACCCV (𐘰) 82
\LinearACCCVI (𐘱) 82
\LinearACCCVII (𐘲) 82
\LinearACCCVIII (𐘳) 83
\LinearACCCX (𐘴) 83
\LinearACCCXI (𐘵) 83
\LinearACCCXII (𐘶) 83
\LinearACCCXIII (𐘷) 83
\LinearACCCXIV (𐘸) 83
\LinearACCCXIX (𐘹) 83
\LinearACCCXL (𐘺) 83
\LinearACCCXLI (𐘻) 83
\LinearACCCXLII (𐘼) 83
\LinearACCCXLIII (𐘽) 83
\LinearACCCXLIV (𐘾) 83
\LinearACCCXLIX (𐘿) 83
\LinearACCCXLV (𐙀) 83
\LinearACCCXLVI (𐙁) 83
\LinearACCCXLVII (𐙂) 83
\LinearACCCXLVIII (𐙃) 83
\LinearACCCXV (𐙄) 83
\LinearACCCXVI (𐙅) 83
\LinearACCCXVII (𐙆) 83
\LinearACCCXVIII (𐙇) 83
\LinearACCCXX (𐙈) 83
\LinearACCCXXI (𐙉) 83
\LinearACCCXXII (𐙊) 83
\LinearACCCXXIII (𐙋) 83
\LinearACCCXXIV (𐙌) 83
\LinearACCCXXIX (𐙍) 83
\LinearACCCXXV (𐙎) 83
\LinearACCCXXVI (𐙏) 83
\LinearACCCXXVII (𐙐) 83
\LinearACCCXXVIII (𐙑) 83
\LinearACCCXXX (𐙒) 83
\LinearACCCXXXI (𐙓) 83

\LinearACCCXXXII (𐘳) 83
\LinearACCCXXXIII (𐘴) 83
\LinearACCCXXXIV (𐘵) 83
\LinearACCCXXXIX (𐘺) 83
\LinearACCCXXXV (𐘶) 83
\LinearACCCXXXVI (𐘷) 83
\LinearACCCXXXVII (𐘸) 83
\LinearACCCXXXVIII (𐘹) 83
\LinearACCI (𐘁) 82
\LinearACCII (𐘂) 82
\LinearACCIII (𐘃) 82
\LinearACCIV (𐘄) 82
\LinearACCIX (𐘈) 82
\LinearACCL (𐘋) 83
\LinearACCLI (𐘌) 83
\LinearACCLII (𐘍) 83
\LinearACCLIII (𐘎) 83
\LinearACCLIV (𐘏) 83
\LinearACCLIX (𐘑) 83
\LinearACCLV (𐘐) 83
\LinearACCLVI (𐘒) 83
\LinearACCLVII (𐘓) 83
\LinearACCLVIII (𐘔) 83
\LinearACCLX (𐘉) 83
\LinearACCLXI (𐘕) 83
\LinearACCLXII (𐘖) 84
\LinearACCLXIII (𐘗) 84
\LinearACCLXIV (𐘘) 84
\LinearACCLXIX (𐘝) 84
\LinearACCLXV (𐘙) 84
\LinearACCLXVI (𐘚) 84
\LinearACCLXVII (𐘛) 84
\LinearACCLXVIII (𐘜) 84
\LinearACCLXX (𐘞) 84
\LinearACCLXXI (𐘟) 84
\LinearACCLXXII (𐘠) 84
\LinearACCLXXIII (𐘡) 84
\LinearACCLXXIV (𐘢) 84
\LinearACCLXXIX (𐘧) 84
\LinearACCLXXV (𐘣) 84
\LinearACCLXXVI (𐘤) 84
\LinearACCLXXVII (𐘥) 84
\LinearACCLXXVIII (𐘦) 84
\LinearACCLXXX (𐘨) 84
\LinearACCLXXXI (𐘩) 84
\LinearACCLXXXII (𐘪) 84
\LinearACCLXXXIII (𐘫) 84
\LinearACCLXXXIV (𐘬) 84
\LinearACCLXXXIX (𐘱) 84
\LinearACCLXXXV (𐘭) 84
\LinearACCLXXXVI (𐘮) 84
\LinearACCLXXXVII (𐘯) 84
\LinearACCLXXXVIII (𐘰) 84
\LinearACCLXXXX (𐘲) 84
\LinearACCV (𐘅) 82
\LinearACCVI (𐘆) 82
\LinearACCVII (𐘇) 82
\LinearACCVIII (𐘈) 82
\LinearACCX (𐘊) 83
\LinearACCXCI (𐘾) 84
\LinearACCXCII (𐘿) 84
\LinearACCXCIII (𐙀) 84
\LinearACCXCIV (𐙁) 84
\LinearACCXCIX (𐙆) 82
\LinearACCXCV (𐙂) 82
\LinearACCXCVI (𐙃) 82
\LinearACCXCVII (𐙄) 82
\LinearACCXCVIII (𐙅) 82
\LinearACCXI (𐘋) 83
\LinearACCXII (𐘌) 83
\LinearACCXIII (𐘍) 83
\LinearACCXIV (𐘎) 83
\LinearACCXIX (𐘓) 83
\LinearACCXL (𐘏) 83
\LinearACCXLI (𐘐) 83
\LinearACCXLII (𐘑) 83
\LinearACCXLIII (𐘒) 83
\LinearACCXLIV (𐘔) 83
\LinearACCXLIX (𐘗) 83
\LinearACCXLV (𐘕) 83
\LinearACCXLVI (𐘖) 83
\LinearACCXLVII (𐘘) 83
\LinearACCXLVIII (𐘙) 83
\LinearACCXV (𐘉) 83
\LinearACCXVI (𐘊) 83
\LinearACCXVII (𐘋) 83
\LinearACCXVIII (𐘌) 83
\LinearACCXX (𐘎) 83
\LinearACCXXI (𐘍) 83
\LinearACCXXII (𐘏) 83
\LinearACCXXIII (𐘐) 83
\LinearACCXXIV (𐘑) 83
\LinearACCXXIX (𐘖) 83
\LinearACCXXV (𐘒) 83
\LinearACCXXVI (𐘓) 83
\LinearACCXXVII (𐘔) 83
\LinearACCXXVIII (𐘕) 83
\LinearACCXXX (𐘉) 83
\LinearACCXXXI (𐘊) 83
\LinearACCXXXII (𐘋) 83
\LinearACCXXXIII (𐘌) 83
\LinearACCXXXIV (𐘍) 83
\LinearACCXXXIX (𐘒) 83
\LinearACCXXXV (𐘎) 83
\LinearACCXXXVI (𐘏) 83
\LinearACCXXXVII (𐘐) 83
\LinearACCXXXVIII (𐘑) 83
\LinearACI (𐘀) 82
\LinearACII (𐘁) 82
\LinearACIII (𐘂) 82
\LinearACIV (𐘃) 82
\LinearACIX (𐘇) 82
\LinearACL (𐘌) 83
\LinearACLI (𐘍) 83
\LinearACLII (𐘎) 83
\LinearACLIII (𐘏) 83
\LinearACLIV (𐘐) 83
\LinearACLIX (𐘔) 83
\LinearACLV (𐘑) 83
\LinearACLVI (𐘒) 83
\LinearACLVII (𐘓) 83
\LinearACLVIII (𐘔) 83
\LinearACLX (𐘊) 83
\LinearACLXI (𐘋) 83
\LinearACLXII (𐘌) 83
\LinearACLXIII (𐘍) 83
\LinearACLXIV (𐘎) 84
\LinearACLXIX (𐘓) 84
\LinearACLXV (𐘏) 84
\LinearACLXVI (𐘐) 84
\LinearACLXVII (𐘑) 84
\LinearACLXVIII (𐘒) 84
\LinearACLXX (𐘔) 84
\LinearACLXXI (𐘕) 84
\LinearACLXXII (𐘖) 84
\LinearACLXXIII (𐘗) 84
\LinearACLXXIV (𐘘) 84
\LinearACLXXIX (𐘝) 84
\LinearACLXXV (𐘙) 84
\LinearACLXXVI (𐘚) 84
\LinearACLXXVII (𐘛) 84
\LinearACLXXVIII (𐘜) 84
\LinearACLXXX (𐘞) 84
\LinearACLXXXI (𐘟) 84
\LinearACLXXXII (𐘠) 84
\LinearACLXXXIII (𐘡) 84
\LinearACLXXXIV (𐘢) 84
\LinearACLXXXIX (𐘧) 84
\LinearACLXXXV (𐘣) 84
\LinearACLXXXVI (𐘤) 84
\LinearACLXXXVII (𐘥) 84
\LinearACLXXXVIII (𐘦) 84
\LinearACLXXXX (𐘨) 84
\LinearACV (𐘁) 82
\LinearACVI (𐘂) 82
\LinearACVII (𐘃) 82
\LinearACVIII (𐘄) 82
\LinearACX (𐘀) 82
\LinearACXCI (𐘶) 84
\LinearACXCII (𐘷) 84
\LinearACXCIII (𐘸) 84
\LinearACXCIV (𐘹) 84
\LinearACXCIX (𐘾) 82
\LinearACXCV (𐘺) 84
\LinearACXCVI (𐘻) 84
\LinearACXCVII (𐘼) 82
\LinearACXCVIII (𐘽) 82
\LinearACXI (𐘁) 82
\LinearACXII (𐘂) 83
\LinearACXIII (𐘃) 83
\LinearACXIV (𐘄) 83
\LinearACXIX (𐘊) 83
\LinearACXL (𐘇) 83
\LinearACXLI (𐘈) 83
\LinearACXLII (𐘉) 83
\LinearACXLIII (𐘊) 83
\LinearACXLIV (𐘋) 83
\LinearACXLIX (𐘏) 83
\LinearACXLV (𐘌) 83
\LinearACXLVI (𐘍) 83
\LinearACXLVII (𐘎) 83
\LinearACXLVIII (𐘏) 83
\LinearACXV (𐘅) 83
\LinearACXVI (𐘆) 83
\LinearACXVII (𐘇) 83
\LinearACXVIII (𐘈) 83
\LinearACXX (𐘊) 83

\LinearACXXI (𐋦) 83
\LinearACXXII (𐋧) 83
\LinearACXXIII (𐋨) 83
\LinearACXXIV (𐋩) 83
\LinearACXXIX (𐋮) 83
\LinearACXXV (𐋪) 83
\LinearACXXVI (𐋫) 83
\LinearACXXVII (𐋬) 83
\LinearACXXVIII (𐋭) 83
\LinearACXXX (𐋯) 83
\LinearACXXXI (𐋰) 83
\LinearACXXXII (𐋱) 83
\LinearACXXXIII (𐋲) 83
\LinearACXXXIV (𐋳) 83
\LinearACXXXIX (𐋸) 83
\LinearACXXXV (𐋴) 83
\LinearACXXXVI (𐋵) 83
\LinearACXXXVII (𐋶) 83
\LinearACXXXVIII (𐋷) 83
\LinearAI (𐘀) 82
\LinearAII (𐘁) 82
\LinearAIII (𐘂) 82
\LinearAIV (𐘃) 82
\LinearAIX (𐘇) 82
\LinearAL (𐘌) 83
\LinearALI (𐘛) 83
\LinearALII (𐘜) 83
\LinearALIII (𐘝) 83
\LinearALIV (𐘞) 83
\LinearALIX (𐘢) 83
\LinearALV (𐘠) 83
\LinearALVI (𐘡) 83
\LinearALVII (𐘗) 83
\LinearALVIII (𐘣) 83
\LinearALX (𐘖) 83
\LinearALXI (𐘑) 83
\LinearALXII (𐘔) 83
\LinearALXIII (𐘕) 83
\LinearALXIV (𐘓) 83
\LinearALXIX (𐘘) 84
\LinearALXV (𐘙) 83
\LinearALXVI (𐘚) 84
\LinearALXVII (𐘤) 84
\LinearALXVIII (𐘥) 84
\LinearALXX (𐘦) 84
\LinearALXXI (𐘧) 84
\LinearALXXII (𐘨) 84
\LinearALXXIII (𐘩) 84
\LinearALXXIV (𐘪) 84
\LinearALXXIX (𐘯) 84
\LinearALXXV (𐘫) 84
\LinearALXXVI (𐘬) 84
\LinearALXXVII (𐘭) 84
\LinearALXXVIII (𐘮) 84
\LinearALXXX (𐘰) 84
\LinearALXXXI (𐘱) 84
\LinearALXXXII (𐘲) 84
\LinearALXXXIII (𐘳) 84
\LinearALXXXIV (𐘴) 84
\LinearALXXXIX (𐘹) 84
\LinearALXXXV (𐘵) 84
\LinearALXXXVI (𐘶) 84
\LinearALXXXVII (𐘷) 84
\LinearALXXXVIII (𐘸) 84
\LinearAV (𐘍) 82
\LinearAVI (𐘎) 82
\LinearAVII (𐘏) 82
\LinearAVIII (𐘐) 82
\LinearAX (𐘈) 82
\LinearAXCI (𐘻) 84
\LinearAXCII (𐘼) 84
\LinearAXCIII (𐘽) 84
\LinearAXCIV (𐘾) 84
\LinearAXCIX (𐙂) 82
\LinearAXCV (𐘿) 84
\LinearAXCVI (𐙀) 84
\LinearAXCVII (𐙁) 84
\LinearAXCVIII (𐙃) 84
\LinearAXI (𐘉) 82
\LinearAXII (𐘊) 82
\LinearAXIII (𐘋) 82
\LinearAXIV (𐙄) 83
\LinearAXIX (𐙇) 83
\LinearAXL (𐙅) 83
\LinearAXLI (𐙆) 83
\LinearAXLII (𐙈) 83
\LinearAXLIII (𐙉) 83
\LinearAXLIV (𐙊) 83
\LinearAXLIX (𐙏) 83
\LinearAXLV (𐙋) 83
\LinearAXLVI (𐙌) 83
\LinearAXLVII (𐙎) 83
\LinearAXLVIII (𐙐) 83
\LinearAXV (𐘌) 83
\LinearAXVI (𐘍) 83
\LinearAXVII (𐘎) 83
\LinearAXVIII (𐘏) 83
\LinearAXX (𐘆) 83
\LinearAXXI (𐘐) 83
\LinearAXXII (𐘑) 83
\LinearAXXIII (𐘒) 83
\LinearAXXIV (𐘓) 83
\LinearAXXIX (𐘗) 83
\LinearAXXV (𐘔) 83
\LinearAXXVI (𐘕) 83
\LinearAXXVII (𐘖) 83
\LinearAXXVIII (𐘘) 83
\LinearAXXX (𐘙) 83
\LinearAXXXI (𐘚) 83
\LinearAXXXII (𐘛) 83
\LinearAXXXIII (𐘜) 83
\LinearAXXXIV (𐘝) 83
\LinearAXXXIX (𐘡) 83
\LinearAXXXV (𐘞) 83
\LinearAXXXVI (𐘟) 83
\LinearAXXXVII (𐘠) 83
\LinearAXXXVIII (𐘢) 83
linearb (package) 85, 86, 119, 121
\Lineload (⇊) 73
linguistic symbols 11–14
\LinearALXXXV (𐘵) 84
\LinearALXXXVI (𐘶) 84
\LinearALXXXVII (𐘷) 84
\LinearALXXXVIII (𐘸) 84
\LinearALXXXX (𐘹) 84
\LinearAV (𐘍) 82
\LinearAVI (𐘎) 82
\LinearAVII (𐘏) 82
\LinearAVIII (𐘐) 82
\LinearAX (𐘈) 82
\LinearAXCI (𐘻) 84
\LinearAXCII (𐘼) 84
\LinearAXCIII (𐘽) 84
\LinearAXCIV (𐘾) 84
\LinearAXCIX (𐙂) 82
\LinearAXCV (𐘿) 84
\LinearAXCVI (𐙀) 84
\LinearAXCVII (𐙁) 84
\LinearAXCVIII (𐙃) 84
\LinearAXI (𐘉) 82
\LinearAXII (𐘊) 82
\LinearAXIII (𐘋) 82
\LinearAXIV (𐙄) 83
\LinearAXIX (𐙇) 83
\LinearAXL (𐙅) 83
\LinearAXLI (𐙆) 83
\LinearAXLII (𐙈) 83
\LinearAXLIII (𐙉) 83
\LinearAXLIV (𐙊) 83
\LinearAXLIX (𐙏) 83
\LinearAXLV (𐙋) 83
\LinearAXLVI (𐙌) 83
\LinearAXLVII (𐙎) 83
\LinearAXLVIII (𐙐) 83
\LinearAXV (𐘌) 83
\LinearAXVI (𐘍) 83
\LinearAXVII (𐘎) 83
\LinearAXVIII (𐘏) 83
\LinearAXX (𐘆) 83
\LinearAXXI (𐘐) 83
\LinearAXXII (𐘑) 83
\LinearAXXIII (𐘒) 83
\LinearAXXIV (𐘓) 83
\LinearAXXIX (𐘗) 83
\LinearAXXV (𐘔) 83
\LinearAXXVI (𐘕) 83
\LinearAXXVII (𐘖) 83
\LinearAXXVIII (𐘘) 83
\LinearAXXX (𐘙) 83
\LinearAXXXI (𐘚) 83
\LinearAXXXII (𐘛) 83
\LinearAXXXIII (𐘜) 83
\LinearAXXXIV (𐘝) 83
\LinearAXXXIX (𐘡) 83
\LinearAXXXV (𐘞) 83
\LinearAXXXVI (𐘟) 83
\LinearAXXXVII (𐘠) 83
\LinearAXXXVIII (𐘢) 83

\Lisa ( ) 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
\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 ( ) 55
\ln (ln) 49
\lnapprox (⪉) 38
\lnapprox (⪉) 38
\lnapprox (⪉) 39
\lneq (⪇) 38
\lneq (⪇) 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
\lrJoin . . . . . *see* \Join
\lrtimes (⋉) 31
\lsem ( ) 55
\lsemantic . . . . . *see* \ldbrack
\Lsh (↰) 42
\Lsh (↰) 41
\Lsh (↰) 43
\Lsteel (⅃) 73
\ltimes (⋉) 23
\ltimes (⋉) 22
\ltimes (⋉) 24
\ltriple 57
Luecking, Dan 106
\lVert (‖) 54
\lVert (‖) 56
\lvert (|) 54
\lvertneqq (≨) 38
\lvertneqq (≨) 38
\lvertneqq (≨) 39
\lwave ( ) 56
\lWavy ( ) 55
\lwavy ( ) 55
\lz (ƛ) 13

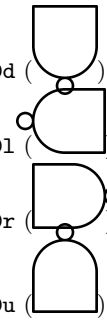
M

\M 10
\M (◌́) 95
\m 10
\m (◌̱) 95
\ma (◌̄) 95
\macron (◌̄) 17
macron (◌̄) . . . . . *see* accents
\Maggie ( ) 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 (▂) 89
\manimpossiblecube (⚅) . . . 89
\mankidney (⚇) 89
\manlhpenkidney (⚇) 89
\manpenkidney (⚇) 89
\manquadrifolium (☘) 89
\manquartercircle (◝) 89
\manrotatedquadrifolium (☘) 89
\manrotatedquartercircle (◜) 89
\manstar (☆) 89
\mantiltpennib (▰) 89
\mantriangledown (▼) 89
\mantriangleright (▶) 89
\mantriangleup (▲) 89
\manvpennib (▮) 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
\Marge ( ) 96
\markera (✕) 93
\markerb (○) 93
married . . . . . *see* \textmarried
\Mars (♂) 71
\Mars (♂) 71
\mars (♂) 71
\MartinVogel (⚧) 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 (euscript 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 (◌̎) 95
\mb (◌̱) 95
\Mbb (◌̎̎) 95
\mBb (◌̱̎) 95
\mbB (◌̱̎) 95
\mbb (◌̱̱) 95
mbboard (package) 68, 119
\mbbx (◌̲̲) 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 (⩛) 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
milstd (package) 73, 119
\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 (⫲) 48
\mmappedfromchar (⫲) 48
\Mmapstochar (⫳) 48
\mmapstochar (⫳) 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 (📱) 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
\moverlay 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 (🌍) 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
\MVRightarrow (➔) 90
\MVSeven (7) 65
\MVSix (6) 65
\MVThree (3) 65
\MVTwo (2) 65
\MVZero (0) 65

N

\nabla (∇) 65
\nabla (∇) 66
\NAK (§) 72
NAND gates 73



\NANDd ( ) 73

\NANDl ( ) 73

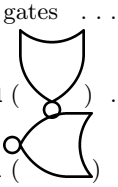
\NANDr ( ) 73

\NANDu ( ) 73
\napprox (≉) 32
\napprox (≉) 33
\napproxeq (≋) 31
\napproxeq (≋) 33
\nasymp (≭) 31
\nasymp (≭) 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
\nbackapprox (⋧) 33
\nbackapproxeq (⪰̸) 33
\nbackcong (≌̸) 33
\nbackeqsim (⋍̸) 33
\nbacksim (≾̸) 31
\nbacksim (≾̸) 33
\nbacksimeq (⋍̸) 31
\nbacksimeq (⋍̸) 34
\nbacktriplesim (⋧) 34
\NBSP ( ) 72
\nBumpeq (≎̸) 31
\nBumpeq (≎̸) 34
\nbumpeq (≏̸) 31
\nbumpeq (≏̸) 34
\ncirceq (≗̸) 34
\ncirclearrowleft (↺̸) . . . 46
\ncirclearrowright (↻̸) . . 46
\nclosedequal (≐̸) 34
\ncong (≇) 32
\ncong (≇) 31
\ncong (≇) 34
\ncurlyeqprec (⋞) 32
\ncurlyeqprec (⋞) 34
\ncurlyeqsucc (⋟) 32
\ncurlyeqsucc (⋟) 34
\ncurvearrowdownup (⤯) . . . 44
\ncurvearrowleft (↶̸) 46
\ncurvearrowleftright (↭̸) 44
\ncurvearrownesw (⤤̸) 44
\ncurvearrownwse (⤥̸) 44
\ncurvearrowright (↷̸) 46
\ncurvearrowrightleft (↭̸) 44
\ncurvearrowsenw (⤢̸) 44
\ncurvearrowswne (⤣̸) 44
\ncurvearrowupdown (⥉̸) . . . 44
\ndasharrow (⇢) 46
\ndasheddownarrow (⇣̸) 45
\ndashedleftarrow (⇠̸) 45
\ndashednearrow (⇗̸) 45
\ndashednwarrow (⇖̸) 45
\ndashedrightarrow (⇢) . . . 45
\ndashedsearrow (⇘̸) 45
\ndashedswarrow (⇙̸) 45
\ndasheduparrow (⇡̸) 45
\ndashleftarrow (⇠̸) 46
\ndashrightarrow (⇢) 46
\nDashV (⊯) 32
\nDashv (⊮) 32
\ndashV (⊯) 32
\ndashv (⊮) 32
\ndashv (⊬) 34
\ndashVv (⊯) 32
\nddtstile (⫤̸) 35
\ndiagdown (⤬̸) 34
\ndiagup (⤫̸) 34
\ndivides (∤) 34
\nDoteq (≑̸) 34
\ndoteq (≑̸) 34
\ndoublefrown (⩒̸) 48
\ndoublefrowneq (⩔̸) 48
\ndoublesmile (⩏̸) 48
\ndoublesmileeq (⩕̸) 48
\nDownarrow (⇟) 45
\ndownarrow (↓̸) 45
\ndownarrowtail (↣̸) 45
\ndowndownarrows (⇊̸) 45
\ndownfilledspoon (⥥̸) 47
\ndownfootline (⊥̸) 34
\ndownfree (⊥̸) 34
\ndownharpoonccw (⥥̸) 46
\ndownharpooncw (⥥̸) 46
\ndownlsquigarrow (⤓̸) 45
\ndownmapsto (↧̸) 45
\ndownModels (⫤̸) 34
\ndownmodels (⫤̸) 34
\ndownpitchfork (⫛̸) 47
\ndownrsquigarrow (⤓̸) 45
\ndownspoon (⥥̸) 47
\ndownuparrows (⇵̸) 45
\ndownupharpoons (⥯̸) 46
\ndownVdash (⫪̸) 34
\ndownvdash (⫪̸) 34
\ndststile (⫣̸) 35
\ndtstile (⫢̸) 35
\ndttstile (⫣̸) 35
\ne . . . . . *see* \neq
\ne (≠) 34
\Nearrow (⇗̸) 42
\Nearrow (⇗̸) 43
\nearrow (↗̸) 42
\nearrow (↗̸) 41, 106, 107
\nearrow (↗̸) 43
\nearrowtail (↗̸) 43
\nefilledspoon (⥧̸) 47
\nefootline (↗̸) 33
\nefree (↗̸) 33
\neg (¬) 65
\neg (¬) 66
negation . . . *see* \neg *and* \sim
\neharpoonccw (↗̸) 46
\neharpooncw (↗̸) 46
\nelsquigarrow (↛̸) 43
\nemapsto (↗̸) 43
\neModels (⫦̸) 33
\nemodels (⫦̸) 33
\nenearrows (↗̸) 43
\nepitchfork (⫙̸) 47
\Neptune (Ψ) 71
\Neptune (Ψ) 71
\neptune (ϒ) 71
\neq (≠) 32
\neq (≠) 37
\neq (≠) 34
\neqbump (≠) 34
\neqcirc (≠) 34
\neqdot (≠) 34
\neqfrown (≠) 48
\neqsim (≠) 33
\neqslantgtr (⩌̸) 38
\neqslantgtr (⩌̸) 39
\neqslantless (⩋̸) 38
\neqslantless (⩋̸) 39
\neqsmile (≠) 48
\nequal (≠) 33
\nequalclosed (≠) 33
\nequiv (≢) 31
\nequiv (≢) 33
\nequivclosed (≢) 33
\nersquigarrow (↝̸) 43
\nespoon (⥱̸) 47
\Neswarrow (⇗̸) 43
\neswarrow (↗̸) 106, 107
\neswarrow (↗̸) 43
\neswarrows (⇗̸) 43
\neswbipropto (∽̸) 24
\neswcrossing (⤬̸) 33
\neswharpoonnwse (⥦̸) 46
\neswharpoons (⥦̸) 46
\neswharpoonsenw (⥧̸) 46
\Neswline (⫽̸) 33
\neswline (⤫̸) 33
\Neutral (⟐) 74
\neVdash (⊮) 33
\nevdash (⊬) 33
\newextarrow 63
\newmetrics 95
\newmoon (●) 71
\newmoon (●) 71
\newtie (⍝) 14
\nexists (∄) 52
\nexists (∄) 52
\nexists (∄) 52
\nfallingdotseq (≒̸) 33
\nfrown (⌢̸) 48
\nfrowneq (≓̸) 48
\nfrowneqsmile (≓̸) 48
\nfrownsmile (≓̸) 48
\nfrownsmileeq (≓̸) 48
\NG (Ŋ) 10
\ng (ŋ) 10
\ngeq (≱) 38
\ngeq (≱) 38
\ngeq (≱) 39
\ngeqclosed (≱) 39, 40
\ngeqdot (≱) 39
\ngeqq (≱) 38
\ngeqq (≱) 38
\ngeqq (≱) 39
\ngeqslant (≱) 38
\ngeqslant (≱) 39
\ngeqslantdot (≱) 39
\ngets (↚) 46
\ngg (≫̸) 38
\ngg (≫̸) 39
\nggg (⋙̸) 39
\ngtr (≯) 38
\ngtr (≯) 38
\ngtr (≯) 39
\ngtrapprox (⪊̸) 38
\ngtrapprox (⪊̸) 38
\ngtrclosed (≯) 39, 40
\ngtrdot (≯) 39
\ngtreqless (⋛̸) 39

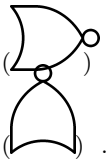
\ngtreqlessslant (⪌̸) 39
\ngtreqqless (⪌̸) 39
\ngtrless (≹) 38
\ngtrless (≹) 39
\ngtrsim (≵) 38
\ngtrsim (≵) 38
\nhateq (≑) 34
\nhookleftarrow (↚) 46
\nhookrightarrow (↛) 46
\ni (∋) 51, 105
\ni (∍) 52
\nialpha (α) 13
\nibar . . . . . *see* \ownsbar
\nibeta (β) 13
\NibLeft (⬲) 76
\NibRight (⬳) 76
nibs 76
\NibSolidLeft (⬷) 76
\NibSolidRight (⬸) 76
nicefrac (package) . 67, 119, 121
\nichi (χ) 13
\niepsilon (ε) 13
\nigamma (γ) 13
\niiota (ι) 13
\nilambda (λ) 13
\nin (∉) 52
\niomega (ω) 13
\niphi (ϕ) 13
\niplus (∋) 31
\nisigma (σ) 13
\nitheta (θ) 13
\niupsilon (υ) 13
\niv (∟) 53
\nj (ȷ) 13
\nlcirclearrowdown (⤈) . . 45
\nlcirclearrowleft (⤇) . . 45
\nlcirclearrowright (⤆) . 45
\nlcirclearrowup (⤉) 45
\nlcurvearrowdown (⤵) 45
\nlcurvearrowleft (↫) 45
\nlcurvearrowne (⬀) 45
\nlcurvearrownw (⬁) 45
\nlcurvearrowright (↬) . . . 45
\nlcurvearrowse (⤳) 45
\nlcurvearrowsw (⤶) 45
\nlcurvearrowup (⤴) 45
\nleadsto (⇜) 46
\nLeftarrow (⇍) 42
\nLeftarrow (⇍) 41
\nLeftarrow (⇍) 45
\nleftarrow (↚) 42
\nleftarrow (↚) 41
\nleftarrow (↚) 45
\nleftarrowtail (↢) 45
\nleftfilledspoon (•↚) . . . 47
\nleftfootline (↚) 34
\nleftfree (↚) 34
\nleftharpoonccw (↼) 46
\nleftharpooncw (↼) 46
\nleftleftarrows (⇇) 45
\nleftlsquigarrow (⇜) 45
\nleftmapsto (↤) 45
\nleftModels (⊭) 34
\nleftmodels (⊭) 34
\nleftpitchfork (⋔) 47
\nLeftrightarrow (⇎) 42
\nLeftrightarrow (⇎) 41
\nLeftrightarrow (⇎) 45
\nleftrightarrow (↮) 42
\nleftrightarrow (↮) . 21, 41
\nleftrightarrow (↮) 45
\nleftrightarrows (↮) 45
\nleftrightharpoondownup (↮) 46
\nleftrightharpoons (⇎) . . 46
\nleftrightharpoonupdown (↮) 46
\nLeftrightline (⇎) 34
\nleftrightline (↮) 34
\nleftrightsquigarrow (↭) 46
\nleftrsquigarrow (⇜) 45
\nleftspoon (⊶) 47
\nleftVdash (⊮) 34
\nleftvdash (⊬) 34
\nleq (≰) 38
\nleq (≰) 38
\nleq (≰) 39
\nleqclosed (⪇̸) 39, 40
\nleqdot (≰) 39
\nleqq (≦̸) 38
\nleqq (≦̸) 38
\nleqq (≦̸) 39
\nleqslant (⩽̸) 38
\nleqslant (⩽̸) 39
\nleqslantdot (⩽̸) 39
\nless (≮) 38
\nless (≮) 38
\nless (≮) 39
\nlessapprox (⪅̸) 38
\nlessapprox (⪅̸) 38
\nlessclosed (⪇̸) 39, 40
\nlessdot (⋖̸) 39
\nlesseqgtr (⋚̸) 39
\nlesseqgtrslant (⋚̸) 39
\nlesseqqgtr (⪋̸) 39
\nlessgtr (≸) 38
\nlessgtr (≸) 39
\nlesssim (≴) 38
\nlesssim (≴) 38
\nlhookdownarrow (↡) 45
\nlhookleftarrow (↚) 45
\nlhooknearrow (↗) 45
\nlhooknwarrow (↖) 44
\nlhookrightarrow (↛) 44
\nlhooksearrow (↘) 44
\nlhookswarrow (↙) 44
\nlhookuparrow (↟) 44
\nll (≪̸) 38
\nll (≪̸) 39
\nLleftarrow (⇍) 44
\nlll (⋘̸) 39
\nmapsto (↦) 46
\nmid (∤) 31
\nmid (∤) 34
\nmodels (⊭) 34
\nmultimap (⊸) 47
\nndtstile (▄‖) 35
\nNearrow (⇗) 44
\nnearrow (↗) 42
\nnearrow (↗) 44
\nnearrowtail (↗) 45
\nnefilledspoon (↗•) 47
\nnefootline (↗) 34
\nnefree (↗) 34
\nneharpoonccw (↗) 46
\nneharpooncw (↗) 46
\nnelsquigarrow (↝) 45
\nnemapsto (↗) 45
\nneModels (⊯) 34
\nnemodels (⊯) 34
\nnenearrows (⇗) 45
\nnepitchfork (⋕) 47
\nnersquigarrow (↝) 45
\nnespoon (↗) 47
\nNeswarrow (⇗) 45
\nneswarrow (↗) 45
\nneswarrows (⇗) 45
\nneswharpoonnwse (↗) . . . 46
\nneswharpoons (⇗) 46
\nneswharpoonsenw (↗) . . . 46
\nNeswline (⇗) 34
\nneswline (↗) 34
\nneVdash (⊯) 34
\nnevdash (⊯) 34
\nnststile (▄|) 35
\nntstile (▄) 35
\nnttstile (▄‖) 35
\nNwarrow (⇖) 45
\nnwarrow (↖) 42
\nnwarrow (↖) 45
\nnwarrowtail (↖) 45
\nnwfilledspoon (↖) 47
\nnwfootline (↖) 34
\nnwfree (↖) 34
\nnwharpoonccw (↖) 46
\nnwharpooncw (↖) 46
\nnwlsquigarrow (↖) 45
\nnwmapsto (↖) 45
\nnwModels (⊮) 33
\nnwmodels (⊮) 34
\nnwnwarrows (⇖) 45
\nnwpitchfork (⋔) 47
\nnwrsquigarrow (↖) 45
\nNwsearrow (⇗) 45
\nnwsearrow (↗) 45
\nnwsearrows (⇗) 45
\nnwseharpoonnesw (↗) . . . 46
\nnwseharpoons (⇗) 46
\nnwseharpoonswne (↗) . . . 46
\nNwseline (⇗) 33
\nnwseline (↗) 33
\nnwspoon (↖) 47
\nnwVdash (⊮) 33

\nnwvdash (⊬) 33
no entry . . . . . *see* \noway
\NoBleech (⍓) 90
\NoChemicalCleaning (⍉) . . 90
nointegrals (wasysym package option) 26
\NoIroning (⏢) 90
non-commutative division . . 63
nonbreaking space 72
NOR gates 73



\NORd ( ) 73

\NORl ( ) 73
norm . . *see* \lVert *and* \rVert



\NORr ( ) 73

\NORu ( ) 73
\NoSun (●) 91
not . . . . . *see* \neg
\not 32, 105
not equal (≠ vs. ≠) 32
\notasymp (≭) 32
\notbackslash (⍀) 71
\notbot (⫮) 52
\notdivides (∤) 32
\notequiv (≢) 32
\notin (∉) 52
\notin (∉) 52
\notin (∉) 52
\notin (∉) 52
\notni (∌) 52
\notowner (∌) 52
\notowns . . *see* \notowner *and* \notni
\notperp (⫫) 32
\notslash (⌿) 71
\notsmallin (∉) 52
\notsmallowns (∌) 52
\nottop (⫪) 52
\NoTumbler (⍁) 90
\novelty (N) 93
\noway (⛀) 91
\nowns (∌) 52
\nparallel (∦) 31
\nparallel (∦) 34
\nparallelslant (⫽) 36
\nperp (⫠) 34
\npitchfork (⫛) 47
\nplus (⨣) 22
\nprec (⊀) 32
\nprec (⊀) 31
\nprec (⊀) 33
\nprecapprox (⪹) 32
\nprecapprox (⪹) 31
\nprecapprox (⪹) 33
\npreccurlyeq (⋠) 32
\npreccurlyeq (⋠) 31
\npreccurlyeq (⋠) 34
\npreceq (⪯) 32
\npreceq (⪯) 31
\npreceq (⪯) 34
\npreceqq (⪵) 31
\nprecsim (⋨) 32
\nprecsim (⋨) 31
\nprecsim (⋨) 34
\nrcirclearrowdown (⟳) . . 45
\nrcirclearrowleft (⟲) . . 45
\nrcirclearrowright (⟳) . 45
\nrcirclearrowup (⟲) 45
\nrcurvearrowdown (⤷) 45
\nrcurvearrowleft (↫) 45
\nrcurvearrowne (↷) 45
\nrcurvearrownw (↶) 45
\nrcurvearrowright (↝) . . . 45
\nrcurvearrowse (↘) 45
\nrcurvearrowsw (↙) 45
\nrcurvearrowup (↑) 45
\nRelbar (⇏) 34
\nrelbar (↛) 34
\nrestriction (↾) 46
\nrhookdownarrow (↧) 45
\nrhookleftarrow (↩) 45
\nrhooknearrow (↗) 45
\nrhooknwarrow (↖) 45
\nrhookrightarrow (↪) 45
\nrhooksearrow (↘) 45
\nrhookswarrow (↙) 45
\nrhookuparrow (↥) 45
\nRightarrow (⇏) 42
\nRightarrow (⇏) 41
\nRightarrow (⇏) 45
\nrightarrow (↛) 42
\nrightarrow (↛) 41
\nrightarrow (↛) 45
\nrightarrowtail (↣) 45
\nrightfilledspoon (⇻) . . 47
\nrightfootline (⇁) 34
\nrightfree (⇀) 34
\nrightharpoonccw (⇀) 46
\nrightharpooncw (⇀) 46
\nrightleftarrows (⇄) 44
\nrightleftharpoons (⇌) . . 46
\nrightlsquigarrow (⇝) . . . 44
\nrightmapsto (↦) 44
\nrightModels (⊭) 34
\nrightmodels (⊭) 34
\nrightpitchfork (⋔) 47
\nrightrightarrows (⇉) . . . 44
\nrightrsquigarrow (⇝) . . . 44
\nrightspoon (⇻) 47
\nrightsquigarrow (⇝) 46
\nrightVdash (⊮) 34
\nrightvdash (⊬) 34
\nrisingdotseq (≒) 34
\nRrightarrow (⇏) 44
\nsdtstile (⫱) 35
\nSearrow (⇘) 44
\nsearrow (↘) 44
\nsearrowtail (↘) 45
\nsefilledspoon (⇘) 47
\nsefootline (↘) 34
\nsefree (↘) 34
\nseharpoonccw (↘) 46
\nseharpooncw (↘) 46
\nselsquigarrow (⇜) 45
\nsemapsto (↘) 45
\nseModels (⊯) 34
\nsemodels (⊯) 34
\nsenwarrows (⇗) 45
\nsenwharpoons (⇗) 46
\nsepitchfork (⋕) 47
\nsersquigarrow (⇜) 45
\nsesearrows (⇘) 45
\nsespoon (⤥) 47
\nseVdash (⊯) 34
\nsevdash (⊮) 34
\nshortmid (∤) 31
\nshortmid (∤) 34
\nshortparallel (∦) 31
\nshortparallel (∦) 34
\nsim (≁) 32
\nsim (≁) 31
\nsim (≁) 34
\nsimeq (≄) 32
\nsimeq (≄) 31
\nsimeq (≄) 34
\nsmile (⌣) 48
\nsmileeq (≄) 48
\nsmileeqfrown (≄) 48
\nsmilefrown (⌣) 48
\nsmilefrowneq (≄) 48
\nsqdoublefrown (⌣) 48
\nsqdoublefrowneq (≄) 48
\nsqdoublesmile (⌣) 48
\nsqdoublesmileeq (≄) 48
\nsqeqfrown (≄) 48
\nsqeqsmile (≄) 48
\nsqfrown (⌣) 48
\nsqfrowneq (≄) 48
\nsqfrowneqsmile (≄) 48
\nsqfrownsmile (≄) 48
\nsqsmile (⌣) 48
\nsqsmileeq (≄) 48
\nsqsmileeqfrown (≄) 48
\nsqsmilefrown (⌣) 48
\nSqsubset (⊏) 37
\nsqSubset (⋤) 37
\nsqsubset (⋢) 37
\nsqsubset (⋢) 37
\nsqsubset (⋢) 37
\nsqsubseteq (⋤) 37
\nsqsubseteq (⋤) 37
\nsqsubseteq (⋤) 37
\nsqsubseteqq (⋥) 37
\nsqsubseteqq (⋥) 37
\nSqsupset (⊐) 37
\nsqSupset (⋥) 37
\nsqsupset (⋣) 37
\nsqsupset (⋣) 37
\nsqsupset (⋣) 37
\nsqsupseteq (⋥) 37
\nsqsupseteq (⋣) 37
\nsqsupseteq (⋣) 37

\nsqsupseteqq (⫋̸) 37
\nsqsupseteqq (⫋̸) 37
\nsqtriplefrown (⋜̸) 48
\nsqtriplesmile (⋝̸) 48
\nsquigarrowdownup (↭̸) . . 45
\nsquigarrowleftright (↭̸) 45
\nsquigarrownesw (⇗̸) 45
\nsquigarrownwse (⇖̸) 45
\nsquigarrowrightleft (⇗̸) 45
\nsquigarrowsenw (⇘̸) 45
\nsquigarrowswne (⇙̸) 45
\nsquigarrowupdown (↭̸) . . . 45
\nsststile (⊮) 35
\nststile (⊮) 35
\nsttstile (⊮) 35
\nSubset (⋐̸) 37
\nSubset (⋐̸) 37
\nSubset (⋐̸) 37
\nsubset (⊂⃒) 37
\nsubset (⊂⃒) 37
\nsubseteq (⊆⃒) 37
\nsubseteq (⊈) 36
\nsubseteq (⊈) 37
\nsubseteqq (⫅̸) 37
\nsubseteqq (⫅̸) 37
\nsubseteqq (⫅̸) 37
\nsucc (⊁) 32
\nsucc (⊁) 31
\nsucc (⊁) 33
\nsuccapprox (⪸̸) 32
\nsuccapprox (⪸̸) 31
\nsuccapprox (⪸̸) 33
\nsuccccurlyeq (⋩̸) 32
\nsuccccurlyeq (⋩̸) 31
\nsuccccurlyeq (⋩̸) 33
\nsucceq (⪰̸) 32
\nsucceq (⪰̸) 31
\nsucceq (⪰̸) 33
\nsucceqq (⪰̸) 31
\nsuccsim (⪸̸) 32
\nsuccsim (⪸̸) 31
\nsuccsim (⪸̸) 33
\nSupset (⋑̸) 37
\nSupset (⋑̸) 37
\nSupset (⋑̸) 37
\nsupset (⊃⃒) 37
\nsupset (⊃⃒) 37
\nsupseteq (⊇⃒) 37
\nsupseteq (⊉) 36
\nsupseteq (⊉) 37
\nsupseteqq (⫆̸) 37
\nsupseteqq (⫆̸) 36
\nsupseteqq (⫆̸) 37
\nSwarrow (⇙̸) 45
\nswarrow (↙̸) 45
\nswarrowtail (↣̸) 45
\nswfilledspoon (⤯̸) 47
\nswfootline (⤓̸) 33
\nswfree (⤓̸) 33
\nswharpoonccw (↽̸) 46
\nswharpooncw (⇁̸) 46
\nswlsquigarrow (⇜̸) 45
\nswmapsto (↛̸) 45
\nswModels (⊯̸) 34
\nswmodels (⊯̸) 34
\nswnearrows (⇗̸) 45
\nswneharpoons (⇗̸) 46
\nswpitchfork (⤬̸) 47
\nswrsquigarrow (⇝̸) 45
\nswspoon (⤬̸) 47
\nswswarrows (⇙̸) 45
\nswVdash (⊯̸) 34
\nswvdash (⊮̸) 34
\ntdtstile (⊮) 35
ntheorem (package) 65
\nthickapprox (≉) 31
\nto (↛) 46
\ntriangleeq (≜̸) 40
\ntriangleleft (⋪) 40
\ntriangleleft (⋪) 39
\ntriangleleft (⋪) 39, 40
\ntrianglelefteq (⋬) 40
\ntrianglelefteq (⋬) 39
\ntrianglelefteq (⋬) . . 39, 40
\ntrianglelefteqslant (⋬) 40
\ntriangleright (⋫) 40
\ntriangleright (⋫) 39
\ntriangleright (⋫) . . . 39, 40
\ntrianglerighteq (⋭) 40
\ntrianglerighteq (⋭) . . . 39
\ntrianglerighteq (⋭) . 39, 40
\ntrianglerighteqslant (⋭) 40
\ntriplefrown (⋜̸) 48
\ntriplesim (≋̸) 34
\ntriplesmile (⋝̸) 48
\ntststile (⊮) 35
\nttstile (⊮) 35
\ntttstile (⊮) 35
\ntwoheaddownarrow (↡̸) . . . 45
\ntwoheadleftarrow (↞̸) . . . 31
\ntwoheadleftarrow (↞̸) . . 45
\ntwoheadnearrow (↗̸) 45
\ntwoheadnwarrow (↖̸) 45
\ntwoheadrightarrow (↠̸) . . 31
\ntwoheadrightarrow (↠̸) . . 45
\ntwoheadsearrow (↘̸) 45
\ntwoheadswarrow (↙̸) 45
\ntwoheaduparrow (↟̸) 45
\nu (ν) 50
nuclear power plant . *see* \SNPP
\NUL (␀) 72
null infinity *see* alphabets, math
null set 65, 66
number sets *see* alphabets, math
number sign . *see* \textnumero
numbers . . . . . *see* digits
    circled 77, 94
numerals
    Linear B 85
    old style 20
\NumLock (Num) 72
\nUparrow (⇞̸) 45
\nuparrow (↟̸) 45
\nuparrowtail (↟̸) 45
\nUpdownarrow (⇟̸) 45
\nupdownarrow (↟̸) 45
\nupdownarrows (⇅̸) 45
\nupdownharpoonleftright (↾̸) 46
\nupdownharpoonrightleft (↿̸) 46
\nupdownharpoons (⥮̸) 46
\nUpdownline (⫴̸) 34
\nupdownline (⫴̸) 34
\nupfilledspoon (⤉̸) 47
\nupfootline (⤒̸) 34
\nupfree (⤒̸) 34
\nupharpoonccw (↾̸) 46
\nupharpooncw (↾̸) 46
\nuplsquigarrow (⇞̸) 45
\nupmapsto (↟̸) 45
\nupModels (⊮̸) 34
\nupmodels (⊮̸) 34
\nuppitchfork (⤉̸) 47
\nuprsquigarrow (⇞̸) 45
\nupspoon (⤉̸) 47
\nupuparrows (⇞̸) 45
\nupVdash (⊮̸) 34
\nupvdash (⊮̸) 34
\nuup (ν) 50
\nvargeq (≥⃒) 38
\nvarleq (≤⃒) 38
\nvarparallel (∦) 31
\nvarparallelinv (⫲) 31
\nVDash (⊯) 32
\nVDash (⊯) 31
\nVDash (⊯) 34
\nVdash (⊮) 32
\nVdash (⊮) 31
\nVdash (⊮) 34
\nvDash (⊭) 32
\nvDash (⊭) 31
\nvDash (⊭) 34
\nvdash (⊬) 32
\nvdash (⊬) 31
\nvdash (⊬) 34
\nVvash (⊯) 32
\Nwarrow (⇖) 42
\Nwarrow (⇖) 43
\nwarrow (↖) 42
\nwarrow (↖) 41, 106
\nwarrow (↖) 43
\nwarrowtail (↖) 43
\nwfilledspoon (⤮̸) 47
\nwfootline (⤔̸) 32
\nwfree (⤔̸) 32
\nwharpoonccw (↼̸) 46
\nwharpooncw (↼̸) 46
\nwlsquigarrow (⇜̸) 43
\nwmapsto (↖) 43
\nwModels (⊮̸) 32
\nwmodels (⊮̸) 32
\nwnwarrows (⇖) 43
\nwpitchfork (⤫̸) 47

\nwrsquigarrow (⍼) 43
\Nwsearrow (⇖) 43
\nwsearrow (↖) 106
\nwsearrow (↖) 43
\nwsearrows (⇖) 43
\nwsebipropto (∿) 24
\nwsecrossing (⤬) 32
\nwseharpoonnesw (⥛) 46
\nwseharpoons (⥣) 46
\nwseharpoonswne (⥚) 46
\Nwseline (⥥) 32
\nwseline (⥥) 32
\nwspoon (⤡) 47
\nwVdash (⫷) 32
\nwvdash (⫷) 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 (ọ) 16
\odiv (⨸) 25
\odot (⊙) 25
\odot (⊙) 22
\odot (⊙) 25
\odplus (⦵) 24
\OE (Œ) 10, 117
\oe (œ) 10, 117
\officialeuro (€) 19
\offinterlineskip 104
ogonek (package) . . 17, 119, 121
ogonek (ę) . . . . . *see* accents
\ogreaterthan (⧁) 22
\ohill (o̓) 16
ohm . . . . . *see* \textohm
\ohm (Ω) 70
\Ohne (O̸) 89
\OHORN (Ơ) 10
\ohorn (ơ) 10
\oiiint (∰) 28
\oiiint (∰) 30
\oiiintclockwise (∱) 28
\oiiintctrclockwise (∱) . 28
\oiint (∯) 27
\oiint (∯) 26, 28
\oiint (∯) 28
\oiint (∯) 30
\oiint (∯) 29
\oiintclockwise (∲) 28
\oiintctrclockwise (∲) . . 28
\oint (∮) 27
\oint (∮) 25
\oint (∮) 29
\ointclockwise (∲) 27
\ointclockwise (∲) 28
\ointclockwise (∲) 30
\ointctrclockwise (∳) 27
\ointctrclockwise (∳) 28
\ointctrclockwise (∳) 30
old-style digits 20
\oldstylenums 20
\oleft (⦵) 25
\olessthan (⦁) 22
\Omega (Ω) 50
\omega (ω) 50
\omegaup (ω) 50
\ominus (⊖) 25
\ominus (⊖) 22
\ominus (⊖) 25
\onlymove (□) 93
\oo (∞) 95
\oo (∞) 13
\ooalign 104, 105
\open (◌̭) 18
open unit disk (𝔻) . . . . . *see* alphabets, math
\openJoin (⨝) 31
\openo (ɔ) 13
\openo (ɔ) 13
\openo (ɔ) 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

\ORd ( ) 73
\oright (⦵) 25

\ORl ( ) 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
\otriangle (⧋) 25, 40
\otriangleup (⧋) 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
\ovoid (○) 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
bbding 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
fclfont 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
hieroglf 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, 68, 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
upgreek 51, 119, 120
upquote 115
url 115
ushort 61, 119, 121
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
yhmath 58, 59, 61, 64, 107, 119
Pakin, Scott 1, 108, 118
\PaperLandscape (▭) 92
\PaperPortrait (▯) 92
par *see* \bindnasrepma, \invamp, and \parr
paragraph mark . . . . . *see* \P
\parallel (∥) 30, 56
\parallel (∥) 33
\ParallelPort (▭) 72
\parallelslant (⫽) 36
\parr (⅋) 24
\partial (∂) 52
\partial (𝜕) 51
\partial (𝛛) 53
\partialslash (�202) 52
\partialvardint (⨍) 67
\partialvardlanddownint (⨑) 67
\partialvardlandupint (⨐) 67
\partialvardlcircleleftint (⟲) 43
\partialvardlcircleleftint (⟲) 67
\partialvardlcirclerightint (⟳) 43
\partialvardlcirclerightint (⟳) 67
\partialvardoiint (∰) . . . 67
\partialvardoint (∯) 67
\partialvardrcircleleftint (⟲) 43
\partialvardrcircleleftint (⟲) 67
\partialvardrcirclerightint (⟳) 43
\partialvardrcirclerightint (⟳) 67
\partialvardstrokedint (⨎) 67
\partialvardsumint (⨋) . . . 67
\partialvartint (⨏) 67
\partialvartlanddownint (⨒) 67
\partialvartlandupint (⨓) 67
\partialvartlcircleleftint (○) 43
\partialvartlcircleleftint (○) 67
\partialvartlcirclerightint (○) 43
\partialvartlcirclerightint (○) 67
\partialvartoiint (∰) . . . 67
\partialvartoint (∮) 67
\partialvartrcircleleftint (○) 43
\partialvartrcircleleftint (○) 67
\partialvartrcirclerightint (○) 44
\partialvartrcirclerightint (○) 67
\partialvartstrokedint (⨍) 67
\partialvartsumint (⨊) . . . 67
particle-physics symbols 74
parts per thousand . . . . . *see* \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 . . . . . *see* faces
percent sign . . . . . *see* \%
\permil (‰) 20
\Perp (⫫) 31
\perp (⊥) 30, 106
\perp (⊥) 33
\perthousand (‰) 70
\Pfund (℔) 18
\PgDown (Page ↓) 72
\PgUp (Page ↑) 72
phaistos (package) . 81, 119, 120
Phaistos disk 81
pharmaceutical prescription *see* \textrecipe
\PHarrow (𐘚) 81
\phase (▭) 70
phasor 70
\PHbee (𐘛) 81
\PHbeehive (𐘜) 81
\PHboomerang (𐘝) 81
\PHbow (𐘞) 81
\PHbullLeg (𐘟) 81
\PHcaptive (𐘠) 81
\PHcarpentryPlane (𐘡) . . . 81
\PHcat (𐘢) 81
\PHchild (𐘣) 81
\PHclub (𐘤) 81
\PHcolumn (𐘥) 81
\PHcomb (𐘦) 81
\PHdolium (𐘧) 81
\PHdove (𐘨) 81
\PHeagle (𐘩) 81
\PHflute (𐘪) 81
\PHgaunlet (𐘫) 81
\PHgrater (𐘬) 81
\PHhelmet (𐘭) 81
\PHhide (𐘮) 81
\PHhorn (𐘯) 81
\Phi (Φ) 50
\phi (𝜙) 50
\phiup (ϕ) 50
\PHlid (𐘰) 81
\PHlily (𐘱) 81
\PHmanacles (𐘲) 81
\PHmattock (𐘳) 81
\Phone (☎) 80
\phone (☎) 88
\PhoneHandset (✆) 80
phonetic (package) . 13, 16, 103, 119
phonetic symbols 11–14
\photon (∼∼∼) 70
photons 74
\PHoxBack (𐘴) 81
\PHpapyrus (𐘵) 81
\PHpedestrian (𐘶) 81
\PHplaneTree (𐘷) 81
\PHplumedHead (𐘸) 81
\PHram (𐘹) 81
\PHrosette (𐘺) 81
\PHsaw (𐘻) 81
\PHshield (𐘼) 81
\PHship (𐘽) 81
\PHsling (𐘾) 81
\PHsmallAxe (𐘿) 81
\PHstrainer (𐙀) 81
\PHtattooedHead (𐙁) 81

\PHtiara ( ) 81
\PHtunny () 81
\PHvine ( ) 81
\PHwavyBand ( ) 81
\PHwoman ( ) 81
physical symbols 70
\Pi (Π) 50
\pi (π) 50
\pi (𝜋) 51
\Pickup (℗) 73
pict2e (package) 70
pifont (package) . . 10, 75–78, 80, 103, 119, 120
pigpen (package) . . 98, 119, 120
pigpen cipher 98
{\pigpenfont A} (⌟) 98
{\pigpenfont B} (⌞) 98
{\pigpenfont C} (⌜) 98
{\pigpenfont D} (⌝) 98
{\pigpenfont E} (⌞·⌟) 98
{\pigpenfont F} (⌜·⌝) 98
{\pigpenfont G} (⌝) 98
{\pigpenfont H} (⌜·⌝) 98
{\pigpenfont I} (⌜) 98
{\pigpenfont J} (⌟) 98
{\pigpenfont K} (⌞·⌟) 98
{\pigpenfont L} (⌞) 98
{\pigpenfont M} (⌝) 98
{\pigpenfont N} (⌞·⌝) 98
{\pigpenfont O} (⌜·⌟) 98
{\pigpenfont P} (⌝·) 98
{\pigpenfont Q} (⌜·⌝·) 98
{\pigpenfont R} (⌜·) 98
{\pigpenfont S} (⋁) 98
{\pigpenfont T} (>) 98
{\pigpenfont U} (<) 98
{\pigpenfont V} (⋀) 98
{\pigpenfont W} (⋁·) 98
{\pigpenfont X} (>·) 98
{\pigpenfont Y} (<·) 98
{\pigpenfont Z} (⋀·) 98
pilcrow . . . . . *see* \P
pipe . . . . . *see* \textpipe
\Pisces (♓) 71
\pisces (♓) 71
\Pisymbol 103
\pitchfork (⋔) 66
\pitchfork (⋔) 30
\pitchfork (⋔) 47
pitchfork symbols . . . 30, 47, 66
Pitman's base-12 symbols . . 65
\piup (π) 50
\planck (ħ) 13
\Plane (✈) 80
planets 71
playing cards . . . . *see* card suits
Plimsoll line 104
\Plus (✚) 76
\plus (+) 24
plus-or-minus sign . . . . *see* \pm
\PlusCenterOpen (✜) 76
\pluscirc (⊕) 23
\PlusOutline (✙) 76
plusses 76, 77
\PlusThinCenterOpen (✛) . . 76
\Pluto (♇) 71
\Pluto (♇) 71
\pluto (♇) 71
\pm (±) 22
\pm (±) 24
\pm (±) 95
\pmb 113
pmboxdraw (package) . . 97, 119, 120
\pmod 49
\pod 49
\pointer (☟) 88
pointing finger . . . . . *see* fists
\Pointinghand (☞) 90
\polishhook (˛) 18
\polter ( ) 63
polutonikogreek (babel package option) 50
polygons 78, 79
polynom (package) 59
polynomial division 59
polytonic Greek 50
\Postbox (✉) 98
PostScript . 51, 69, 75, 103, 112
PostScript fonts 75, 103
\Pound (℔) 19
\pounds (£) 9, 115, 116
power set . *see* alphabets, math
\powerset (℘) 52
\Pp (⁖) 95
\pp (⁖) 95
\ppm (⁂) 95
\Ppp (⁝) 95
\ppp (⁝) 95
\Pppp (⁞) 95
\pppp (⁞) 95
\Ppppp (⁞) 95
\ppppp (⁞) 95
\Pr (Pr) 49
\prec (≺) 30
\prec (≺) 32
\precapprox (⪷) 32
\precapprox (⪷) 30
\precapprox (⪷) 33
\preccurlyeq (≼) 32
\preccurlyeq (≼) 30
\preccurlyeq (≼) 33
\precdot (⪡) 32
\preceq (⪯) 30
\preceq (≼) 33
\preceqq (⪳) 31
\precnapprox (⪹) 32
\precnapprox (⪹) 31
\precnapprox (⪹) 34
\precneq (⪱) 32
\precneqq (⪵) 31
\precnsim (⋨) 32
\precnsim (⋨) 31
\precnsim (⋨) 34
\precsim (≾) 32
\precsim (≾) 30
\precsim (≾) 33
prescription . . *see* \textrecipe
present-value symbols 108
\prime (′) 65
\prime (′) 66
\Printer (🖷) 72
printer's fist . . . . . *see* fists
probabilistic independence . 106
\prod (∏) 25
\prod (∏) 29
projective space (ℙ) . . . . . *see* alphabets, math
\projlim (proj lim) 49
pronunciation symbols . . . . *see* phonetic symbols
proof, end of 65
proper subset/superset . . . . *see* \subsetneq/\supsetneq
proper vertices 74
\propto (∝) 66
\propto (∝) 30
\propto (∝) 33
proto-Semitic symbols 81
protosem (package) 81, 119, 120
\ProvidesPackage 119
\PrtSc (PrtSc) 72
\ps (␣) 95
pseudographics 97
\Psi (Ψ) 50
\psi (ψ) 50
\psiup (ψ) 50
psnfss (package) 77
\Pu (·) 89
pullback diagrams 106
pulse diagram symbols 70
\PulseHigh (⎍) 70
\PulseLow (⎍) 70
punctuation 10
pushout diagrams 106
\pwedge (∧) 13
pxfonts (package) . 21–23, 27, 30, 31, 36–38, 41, 42, 48, 50–52, 65, 66, 68, 100, 115
\Pxp (⁖) 95
\pxp (⁖) 95

Q

Q.E.D. 65
\qoppa (ϟ) 87
\qside (≪) 93
\Quadrad (▦) 57

\quadrad (⫿) 57
\Quadras (⟦) 57
\quadras (⫿) 57
quarter note *see* musical symbols
\quarternote (♩) 88
\quarternote (♩) 88
quaternions (ℍ) *see* alphabets, math
quaver . . . *see* musical symbols
queen 94
\quotedblbase („) 10, 117
\quotesinglbase (‚) . . 10, 117

R

\R (∼) 95
\r (r̊) 14
\r (∼) 95
\Radiation (☢) 92
radicals . . *see* \sqrt *and* \surd
\Radioactivity (☢) 74
\Rain (⫻) 91
\RainCloud (🌧) 91
raising . . . . . *see* \textraising
\RaisingEdge (⌐) 70
\Rangle (⩾) 68
\rAngle (⟫) 56
\rangle (⟩) 21, 54
\rangle (⟩) 55
\ranglebar (⟩) 55
\RArrow (⇨) 72
\rarrowfill 62
\ratio (:) 36
\RATIONAL (ℚ) 49
\Rational (ℚ) 49
rational numbers (ℚ) . . . . . *see* alphabets, math
rationalized Planck constant *see* \hbar
\Rbag (⟆) 53
\rbag (⟆) 53
\rbrace (}) 55
\Rbrack (⟧) 68
\rBrack (⟧) 56
\rc (r̨) 16
\rCeil (⌉) 56
\rceil (⌉) 54
\rceil (⌉) 55
\rcirclearrowdown (↻) . . . 44
\rcirclearrowleft (↺) . . . 44
\rcirclearrowright (↻) . . 44
\rcirclearrowup (↺) 44
\rcircleleftint (∱) 29
\rcirclerightint (∱) 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 (ℝ) *see* alphabets, math
recipe . . . . . *see* \textrecipe
\recorder (℗) 88
\Rectangle (▌) 80
\RectangleBold (▉) 80
rectangles 80
\RectangleThin (▏) 80
\Rectpipe (▯) 73
\Rectsteel (■) 73
recycle (package) 99, 119
\recycle (♲) 99
recycling symbols 98, 99
reduced quadrupole moment *see* \rqm
\reflectbox 103
registered trademark . . . . . *see* \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 (℟) 118
\restoresymbol 100
\restriction . . . . . *see* \upharpoonright
\restriction (↾) 42
\restriction (↾) 46
retracting *see* \textretracting
\Return (⏎) 72
return . . . . . *see* carriage return
\revaw (⦚) 56
\revD (ↁ) 13
\revddots (⋰) 107
\reve (ɘ) 13
\reveject (ɤ) 13
\revepsilon (ɜ) 13, 103
reverse solidus . . . . . *see* \textbackslash
reversed symbols 103
\reversedvideodbend ( ) . 89
\revglotstop (ʕ) 13
\Rewind (◀) 90
\RewindToIndex (⏮) 90
\RewindToStart (⏮) 90
\rfilet (⦚) 55
\rFloor (⌋) 56
\rfloor (⌋) 54
\rfloor (⌋) 55
\rgroup (⎭) 54
\rgroup (⎫) 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
\rhoup (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
\rightevaw (⦚) 56
\rightfilledspoon (⇻) . . . 47
\rightfootline (⫣) 33
\rightfree (⇾) 33
\righthalfcap (⌝) 24
\righthalfcup (⌟) 24
\righthand (☞) 76
\rightharpooncw (⇁) 46
\rightharpooncw (⇁) 46
\rightharpoondown (⇁) . . . 43
\rightharpoondown (⇁) . . . 41
\rightharpoonup (⇀) 43
\rightharpoonup (⇀) 41
\rightleftarrows (⇄) 42
\rightleftarrows (⇄) 41
\rightleftarrows (⇄) 43
\rightleftharpoon (⇌) . . . 43

\rightleftharpoons (⇌) .. 43
\rightleftharpoons (⇌) .. 41
\rightleftharpoons (⇌) .. 41
\rightleftharpoons (⇌) ... 46
\rightleftharpoonsfill ... 62
\rightlsquigarrow (⇝) 43
\rightmapsto (↦) 43
\rightModels (⊨) 33
\rightmodels (⊨) 33
\rightmoon (☽) 71
\rightmoon (☽) 71
\rightp (˃) 18
\rightpitchfork (⋔) 47
\rightpointleft (☜) 76
\rightpointright (☞) ... 76
\rightpropto (∝) 33
\rightrightarrows (⇉) ... 42
\rightrightarrows (⇉) ... 41
\rightrightarrows (⇉) 43
\rightrightharpoons (⥤) .. 43
\rightrsquigarrow (⇝) 43
\Rightscissors (✂) 75
\rightslice (⪧) 22
\rightslice (▷) 33
\rightspoon (⊸) 47
\rightsquigarrow (⇝) ... 42
\rightsquigarrow (⇝) 41
\rightsquigarrow (⇝) 44
\rightt (⊢) 18
\rightthereforе (∴) ... 23, 64
\rightthreetimes (⋌) 66
\rightthreetimes (⋌) 22
\rightthreetimes (⋌) 23
\rightthumbsdown (👎) ... 76
\rightthumbsup (👍) 76
\righttoleftarrow (↼) ... 42
\Righttorque (⥬) 73
\rightturn (↻) 88
\rightVdash (⊩) 33
\rightvdash (⊢) 33
\rightwave (≀) 56
\rightY (↾) 23
\ring (˚) 58
ring (˚) ..... *see* accents
ring equal to ..... *see* \circeq
ring in equal to ... *see* \eqcirc
\riota (ɪ) 13
\rip (⨤) 93
\risingdotseq (≓) 32
\risingdotseq (≓) 30
\risingdotseq (≓) 33
\rJoin (⋊) 31
\rlap 79, 106
\rmoustache (⎱) 54
\rmoustache (⎱) 55
Roman coins 19
Romanian comma-belo accent (ș)
..... *see* accents
rook 94
roots ..... *see* \sqrt
\rotatebox 17, 103
rotated symbols . 11–13, 17, 103
rotating (package) 19, 72
\rotm (ɯ) 13
\rotOmega (ʊ) 13
\rotr (ɹ) 13
\rotvara (ɒ) 13
\rotw (ʍ) 13
\roty (ʎ) 13
\RoundedLsteel (⊤) 73
\RoundedTsteel (L) 73
\RoundedTTsteel (I) 73
\Rparen (⦆) 68
\rqm (ɾ) 105
\rrangle (⟫) 55
\rrbracket (⟧) 54
\rrbracket (⟧) 57
\rrceil (⌉) 53
\rrfloor (⌋) 53
\Rrightarrow (⇛) 42
\Rrightarrow (⇛) 43
\rrparenthesis (⦆) 53
\RS (▲) 72
\rsem (⦈) 55
\rsemantic ..... *see* \rdbrack
\Rsh (↱) 42
\Rsh (↱) 41
\Rsh (↱) 43
\rtimes (⋊) 23
\rtimes (⋊) 22
\rtimes (⋊) 23
\rtriple 57
\rVert (⦀) 56
\rVert (‖) 54
\rvert (|) 54
\rwave (≀) 56
\rWavy (≀) 55
\rwavy (≀) 55

S

\S (§) 9, 116
\SAa (∘) 87
\SAb (∏) 87
\SAd (ԋ) 87
\SAdb (⊞) 87
\SAdd (⊟) 87
\SAf (◊) 87
safety-related symbols 74
\SAg (⌉) 87
\SAga (⍞) 87
\Sagittarius (♐) 71
\sagittarius (♐) 71
\SAh (Ⲩ) 87
\SAhd (Ψ) 87
\SAhu (Ⲭ) 87
\SAk (ԡ) 87
\SAl (⅃) 87
\SAlq (ԃ) 87
\SAm (⅁) 87
\samebishops (▟) 93
\Sampi (ϡ) 87
\sampi (ϡ) 87
\SAn (ㄣ) 87
sans (dsfont package option) . 68
\SAo (ԅ) 87
\SAq (ԛ) 87
\SAr (ↀ) 87
\sarabfamily 87
sarabian (package) . 87, 119, 121
\SAs (ϗ) 87
\SAsa (ϛ) 87
\SAsd (ϧ) 87
\SAsv (ԡ) 87
\SAt (Ⲭ) 87
\SAtb (ϧ) 87
\SAtd (ⅅ) 87
\satellitedish (🛰) 80
satisfies ..... *see* \models
\Saturn (♄) 71
\Saturn (♄) 71
\saturn (♄) 71
savesym (package) 100
\savesymbol 100
\SAw (ϖ) 87
\SAy (ʔ) 87
\SAz (Ⲍ) 87
\SAzd (ϧ) 87
\Sborder (🖃) 80
\scalebox 100
scaling
  mechanical 109, 112
  optical 109
\scd (ᴅ) 13
\scg (ɢ) 13
\schwa (ə) 13
\schwa (ə) 13
Schwartz distribution spaces *see* alphabets, math
\sci (ɪ) 13
scientific symbols 70–74
\ScissorHollowLeft (🏿) .. 75
\ScissorHollowRight (🏿) . 75
\ScissorLeft (✁) 75
\ScissorLeftBrokenBottom (✁) 75
\ScissorLeftBrokenTop (✁) 75
\ScissorRight (✂) 75
\ScissorRightBrokenBottom (✂) 75
\ScissorRightBrokenTop (✂) 75
scissors 75
\scn (ɴ) 13
\scoh (⌒) 36
\Scorpio (♏) 71
\scorpio (♏) 71
\scr (ʀ) 13

script letters *see* alphabets, math
\scripta (𝒶) 13
\scriptg (ℊ) 13
\scriptscriptstyle . . 105, 106
\scriptstyle 105, 106
\scriptv (𝓋) 13
\Scroll (Scroll) 72
\scu (ᴜ) 13
\scy (ʏ) 13
\sddtstile (⊩) 35
\sdststile (⊩) 35
\sdtstile (⊩) 35
\sdttstile (⊩) 35
seagull . . . . . *see* \textseagull
\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 . . *see* \second
\secstress (ˌ) 18
section mark . . . . . *see* \S
\SectioningDiamond (◈) . . 92
sedenions (𝕊) . . *see* alphabets, math
\sefilledspoon (↘) 47
\sefootline (↘) 33
\sefree (↘) 33
segmented digits 70
\seharpooncccw (↘) 46
\seharpooncw (↘) 46
\selectfont 8
\selsquigarrow (↘) 43
semantic valuation 54–57
\semapsto (↘) 43
semibreve . *see* musical symbols
semidirect products . . 22, 23, 66
semiquaver *see* musical symbols
semitic transliteration . . 14, 17
\seModels (≼) 33
\semodels (≼) 33
semtrans (package) . 14, 17, 119, 120
\senwarrows (↘) 43
\senwharpoons (↘) 46
\SePa (𐬹) 89
\separated (⟩⟨) 33
\sepitchfork (⋔) 47
\seppawns (○···○) 93
\SerialInterface (⌧) 72
\SerialPort (▭) 72
\sersquigarrow (↘) 43
\sesearrows (↘) 43
\sespoon (◟) 47
set operators
intersection . . . . *see* \cap
membership . . . . . *see* \in
union . . . . . *see* \cup
\setminus (\) 22
\setminus (∖) 24
\seVdash (⊀) 32
\sevdash (⊀) 33
SGML 117
sha (Ш) 103
\sharp (♯) 65, 88
\sharp (♯) 66
\shfermion 74
\Shift (Shift ⇑) 72
\shift (↕) 21
\Shilling (ß) 18
\shneg (↑) 21
\shortcastling (O-O) 93
\shortdownarrow (↓) 42
\ShortFifty (50) 90
\ShortForty (40) 90
\shortleftarrow (←) 42
\shortmid (ı) 30
\shortmid (ı) 24
\ShortNinetyFive (95) 90
\shortparallel (ıı) 30
\shortparallel (ıı) 32
\ShortPulseHigh (⎍) 70
\ShortPulseLow (⎍) 70
\shortrightarrow (→) 42
\ShortSixty (60) 90
\ShortThirty (30) 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 . . . . *see* musical symbols
\sixteenthnote (♬) 88
skak (package) . 93, 94, 119, 120
skull (package) 93, 119, 120
\skull (☠) 93
\slash (/) 115
\slashb (⧸) 13
\slashc (ɛ̸) 13
\slashd (đ) 13
\slashdiv (⁄) 23
slashed (package) 105
\slashed 105
slashed letters 105
slashed.sty (file) 105
\slashu (μ̸) 13
\Sleet (⁛) 91
\sliding (▪) 16
\smallbosonloop 74
\smallbosonloopA 74
\smallbosonloopV 74
\SmallCircle (○) 79
\SmallCross (×) 79
\smalldiamond (⋄) 25
\SmallDiamondshape (◇) . . 79
\smallfrown (⌢) 30
\smallfrown (⌢) 48
\SmallHBar (⁻) 79
\smallin (∈) 52
\smallint (∫) 66
\SmallLowerDiamond (◆) . . 79
\smalllozenge (◊) 79
\smallowns (∋) 52
\smallpencil ( ) 76
\smallprod (∏) 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

\smalltriangleup (▵) .. 25, 40
\SmallVBar (❘) 79
\smile (⌣) 30
\smile (⌣) 48
smile symbols 48
\smileeq (⩒) 48
\smileeqfrown (⩓) 48
\smilefrown (⩑) 48
\smilefrowneq (⩔) 48
\Smiley (☺) 90
\smiley (☺) 88
smiley faces 72, 88, 90, 98
\sndtstile (▪‖) 35
\Snow (❄) 91
\SnowCloud (🌨) 91
\Snowflake (❄) 78
\SnowflakeChevron (❄) ... 78
\SnowflakeChevronBold (❄) 78
snowflakes 78
\SNPP (℻) 96
\snststile (▪❘) 35
\sntstile (▪❘) 35
\snttstile (▪❘‖) 35
\SO (♬) 72
\SOH (☺) 72
South Arabian alphabet 87
space
thin 113
visible ..... *see* \textvisiblespace
\Spacebar (▯) 72
spades (suit) 65–67, 80
\spadesuit (♠) 65
\spadesuit (♠) 66
\Sparkle (❇) 78
\SparkleBold (❇) 78
sparkles 78
"special" characters 9
\SpecialForty (🕾) 90
\sphericalangle (∢) 66
\sphericalangle (◁) 66
\sphericalangle (≺) 66
\SpinDown ()↓..... 79
\SpinUp (↑) 79
\spirituslenis (◌̓) 58
\spirituslenis (◌̓) 58
\splitvert (¦) 72
spoon symbols 47
\spreadlips (▪) 16
\sqbullet (▪) 23
\sqcap (⊓) 23
\sqcap (⊓) 22
\sqcap (⊓) 23
\sqcapdot (⩋) 23
\sqcapplus (⩏) 23
\sqcapplus (⩏) 23
\sqcup (⊔) 23
\sqcup (⊔) 21, 22
\sqcup (⊔) 23
\sqcupdot (⩃) 24
\sqcupplus (⩅) 23
\sqcupplus (⩅) 24
\sqdoublecap (⩋) 23
\sqdoublecup (⩌) 23
\sqdoublefrown (⩒) 48
\sqdoublefrowneq (⩓) 48
\sqdoublesmile (⩑) 48
\sqdoublesmileeq (⩔) 48
\sqeqfrown (⩕) 48
\sqeqsmile (⩖) 48
\sqfrown (⌢) 48
\sqfrowneq (≓) 48
\sqfrowneqsmile (≒) 48
\sqfrownsmile (⌢) 48
\sqiiint (⨌) 27
\sqiint (⨍) 27
\sqiint (⨍) 28
\sqint (⨖) 27
\sqint (⨖) 28
\sqrt (√▪) 59, 106
\sqsmile (⌣) 48
\sqsmileeq (⩒) 48
\sqsmileeqfrown (⩓) 48
\sqsmilefrown (⩑) 48
\Sqsubset (⊏) 37
\sqSubset (⊏) 37
\sqsubset (⊏) 37
\sqsubset (⊏) 36, 37
\sqsubset (⊏) 37
\sqsubseteq (⊑) 37
\sqsubseteq (⊑) 36
\sqsubseteq (⊑) 37
\sqsubseteqq (⫅) 37
\sqsubseteqq (⫅) 37
\sqsubsetneq (⊏̸) 37
\sqsubsetneq (⊏̸) 37
\sqsubsetneqq (⫋̸) 37
\sqsubsetneqq (⫋̸) 37
\Sqsupset (⊐) 37
\sqSupset (⊐) 37
\sqsupset (⊐) 37
\sqsupset (⊐) 36, 37
\sqsupset (⊐) 37
\sqsupseteq (⊒) 37
\sqsupseteq (⊒) 36
\sqsupseteq (⊒) 37
\sqsupseteqq (⫆) 37
\sqsupseteqq (⫆) 37
\sqsupsetneq (⊐̸) 37
\sqsupsetneq (⊐̸) 37
\sqsupsetneqq (⫌̸) 37
\sqsupsetneqq (⫌̸) 37
\sqtriplefrown (⩒) 48
\sqtriplesmile (⩑) 48
\Square (□) 79
\Square (□ vs. □ vs. □) .. 101
\Square (□) 77
\Square (□) 80
\square (▫) 23
\square (□) 66
\square (□) 25
square root ..... *see* \sqrt
hooked ..... *see* \hksqrt
\SquareCastShadowBottomRight (❏) 80
\SquareCastShadowTopLeft (❐) 80
\SquareCastShadowTopRight (❐) 80
\Squaredot (·) 67
\squaredots (∷) 24, 64
\Squarepipe (◘) 73
squares 79–80, 94
\SquareShadowA (❑) 79
\SquareShadowB (❑) 79
\SquareShadowBottomRight (❑) 80
\SquareShadowC (❑) 79
\SquareShadowTopLeft (❐) . 80
\SquareShadowTopRight (❐) 80
\SquareSolid (■) 80
\Squaresteel (■) 73
\squarewithdots (⚃) 80
\squigarrowdownup (↯) ... 43
\squigarrowleftright (↭) . 43
\squigarrownesw (⇜) 43
\squigarrownwse (⇝) 43
\squigarrowrightleft (⇄) . 43
\squigarrowsenw (↯) 43
\squigarrowswne (↯) 43
\squigarrowupdown (↕) 43
\squplus (⨄) 23
\SS (SS) 10
\ss (ß) 10
\ssdtstile (▪‖) 35
\ssearrow (↘) 42
\sslash (⫽) 22
\sssttstile (▪▪) 35
\ssttstile (▪▪) 35
\ssttstile (▪‖) 35
\sswarrow (↙) 42
\stackrel 21, 104, 108
standard state 104
\star (⋆) 22, 107
\star (⋆) 25
Star of David 77, 78
\starredbullet (✦) 78
stars 66, 77–79
\stater (⚡) 19
statistical independence ... 106
\staveI ( ) 97
\staveII ( ) 97
\staveIII ( ) 97
\staveIV ( ) 97
\staveIX ( ) 97
\staveL ( ) 97, 98

\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
\staveX ( ) 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 (ϛ) 87
stmaryrd (package) 22, 26, 31, 37, 40, 42, 48, 53, 54, 101, 104, 118–120
stochastic independence *see* \bot
\StoneMan () 91
\Stopsign () 74
\StopWatchEnd () 91
\StopWatchStart () 91
\stress (') 18
\strictfi (⥼) 31
\strictif (⥽) 31
\strictiff (⥾) 31
\strokedint (⨍) 29
\StrokeFive () 92
\StrokeFour () 92
\StrokeOne () 92
\StrokeThree () 92
\StrokeTwo () 92
\ststst () 104
\stststile () 35
\sttstile () 35
\stttstile () 35
\STX (☻) 72
\SUB (→) 72
subatomic particles 74
\subcorner () 16
\subdoublebar () 16
\subdoublevert () 16
\sublptr () 16
\subrptr () 16
subscripts
new symbols used in . . 105
\Subset (⋐) 37
\Subset (⋐) 36
\Subset (⋐) 37
\subset (⊂) 37
\subset (⊂) 36
\subset (⊂) 37
\subseteq (⊆) 37
\subseteq (⊆) 36
\subseteq (⊆) 37
\subseteqq (⫅) 37
\subseteqq (⫅) 36
\subseteqq (⫅) 37
\subsetneq (⊊) 37
\subsetneq (⊊) 36
\subsetneq (⊊) 37
\subsetneqq (⫋) 37
\subsetneqq (⫋) 36
\subsetneqq (⫋) 37
\subsetplus (⪿) 37
\subsetpluseq (⫃) 37
subsets 36, 37
\succ (≻) 30
\succ (≻) 32
\succapprox (⪸) 32
\succapprox (⪸) 30
\succapprox (⪸) 32
\succcurlyeq (≽) 32
\succcurlyeq (≽) 30
\succcurlyeq (≽) 32
\succdot (≻) 32
\succeq (⪰) 30
\succeq (⪰) 32
\succeqq (⪴) 31
\succnapprox (⪺) 32
\succnapprox (⪺) 31
\succnapprox (⪺) 34
\succneq (⪶) 32
\succneqq (⪶) 31
\succnsim (⋩) 32
\succnsim (⋩) 31
\succnsim (⋩) 34
\succsim (≿) 32
\succsim (≿) 30

\succsim (≿) 32
such that 103, 105
\suchthat (∋) 105
\sum (∑) 25
\sum (∑) 29
\sumint (∯) 29
\Summit (▲) 91
\SummitSign (✝) 91
\Sun (⊙) 71
\Sun (☉ vs. ☼ vs. ⊙) 101
\Sun (☼) 91
\Sun (☉) 71
\sun (☼) 88
\SunCloud (🌥) 91
\SunshineOpenCircled (🌞) . 80
\sup (sup) 49
superscripts
new symbols used in . . 105
supersets 36, 37
supremum . . . . . *see* \sup
\Supset (⋑) 37
\Supset (⋑) 36
\Supset (⫐) 37
\supset (⊃) 37
\supset (⊃) 36
\supset (⊃) 37
\supseteq (⊇) 37
\supseteq (⊇) 36
\supseteq (⫆) 37
\supseteqq (⫆) 37
\supseteqq (⫆) 36
\supseteqq (⫆) 37
\supsetneq (⊋) 37
\supsetneq (⊋) 36
\supsetneq (⫋) 37
\supsetneqq (⫌) 37
\supsetneqq (⫌) 36
\supsetneqq (⫌) 37
\supsetplus (⫀) 37
\supsetpluseq (⫂) 37
\surd (√) 65
\SurveySign (🛆) 91
\Swarrow (⇙) 42
\Swarrow (↙) 43
\swarrow (↙) 42
\swarrow (↙) 41, 106, 107
\swarrow (↙) 43
\swarrowtail (↣) 43
\swfilledspoon (🥄) 47
\swfootline (⌿) 32
\swfree (⌿) 33
\swharpoonccw (↽) 46
\swharpooncw (↽) 46
\swlsquigarrow (↜) 43
\swmapsto (↤) 43
\swModels (⇺) 33
\swmodels (⇺) 33
\swnearrows (⇘) 43
\swneharpoons (⇃) 46
swords 91
\swpitchfork (⋔) 47
\swrsquigarrow (↜) 43
\swspoon (🥄) 47
\swswarrows (⇙) 43
swung dash . . . . . *see* \sim
\swVdash (⇹) 33
\swvdash (↽) 33
\syl (▪) 16
\syllabic (◌) 18
\symA (𝔸) 68
\symAE (𝔸) 68
\symB (𝔹) 68
\symbishop (♗) 94
Symbol (font) 51, 103
symbols
actuarial 108
alpine 91
ancient language . . 81–87
annuity 108
APL 71
astrological 71
astronomical 71, 98
biological 74
block-element 97
body-text 9–20
bold 113
box-drawing 97
chess 93, 94
cipher 98
clock 88, 90–92
communication 73
computer hardware 72
contradiction 21, 48
currency 18, 19, 68
dangerous bend 89
definition 21, 108
dictionary 11–14, 96
dingbat 75–80
dot 9, 63, 64, 107
electrical 70
engineering 70, 73
extensible . . 47, 59–63, 70, 102, 107–109
Feynman diagram 74
Frege logic . . 47, 53, 65, 67
frown 48
gates, digital logic 73
genealogical 88
general 88
Go stones 94
information 90
informator 93
inverted . . . 11–13, 17, 103
keyboard 72
Knuth's 89
laundry 90
legal 9, 19, 116
letter-like 51–53
life insurance 108
linear logic 21–23, 25, 29–30, 36, 51, 52
linguistic 11–14
log-like 49, 113
logic 73
magical signs 97
mathematical 21–69
METAFONTbook 89
metrical 95
miscellaneous . . 65–67, 80, 88–99
monetary 18, 19, 68
musical . 20, 65, 66, 88, 89
navigation 90
non-commutative division 63
particle physics 74
Phaistos disk 81
phonetic 11–14
physical 70
pitchfork 30, 47, 66
Pitman's base-12 65
present value 108
proto-Semitic 81
pulse diagram 70
recycling 98, 99
relational 30
reversed 103
rotated . . . 11–13, 17, 103
safety-related 74
scientific 70–74
Simpsons characters . . . 96
smile 48
spoon 47
staves 97
subset and superset 36, 37
technological 70–74
TEXbook 89
transliteration 14
upside-down 11–13, 17, 103, 114
variable-sized . 25–30, 100, 102
weather 91
zodiacal 71
symbols.tex (file) 100, 119
\symC (ℂ) 68
\symking (♔) 94
\symknight (♘) 94
\symOE (Ő) 68
\sympawn (♙) 94
\symqueen (♕) 94
\symrook (♖) 94
\symUE (Ű) 68
\SYN (▬) 72

T

\T 10
\T (▪) 17
\T (⊗) 95
\t (◌) 14
\t (⊗) 95
t4phonet (package) . 14, 17, 119, 120
\Tab (⟺) 72
\tabcolsep 104
tacks 30, 51

\taild (ɖ) 13
\tailinvr (ɻ) 13
\taill (ɭ) 13
\tailn (ɳ) 13
\tailr (ɽ) 13
\tails (ʂ) 13
\tailt (ʈ) 13
\tailz (ʐ) 13
\Takt 89
\talloblong ([]) 22
tally markers 85, 92
\tan (tan) 49
\tanh (tanh) 49
\Tape (📣) 80
\Taschenuhr (⏱) 91
Tate-Shafarevich group *see* sha
\tau (τ) 50
\Taurus (♉) 71
\Taurus (♉) 71
\taurus (♉) 71
tautology . . . . . *see* \top
\tauup (τ) 50
\tccentigrade (℃) 65
\tcmu (μ) 65
\tcohm (Ω) 65
\tcpertenthousand (‱) . . 65
\tcperthousand (‰) 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 (ʧ) 13
testfont.dvi (file) 111
testfont.tex (file) . . . 111, 112
\tetartemorion (ↄ) 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 (æ) 12
\textasciiacute (´) . . 18, 116
\textasciibreve (˘) 18
\textasciicaron (ˇ) 18
\textasciicircum (ˆ) . . 9, 115, 117
\textasciidieresis (¨) 18, 116
\textasciigrave (`) 18
\textasciimacron 115
\textasciimacron (¯) 18, 116
\textasciitilde (˜) 9, 115, 117
\textasteriskcentered (∗) . 9, 20
\textbabygamma (ɣ) 11
\textbackslash (\) . 9, 114, 115
\textbaht (฿) 18
\textbar (|) 9, 114
\textbarb (ƀ) 11
\textbarc (ȼ) 11
\textbard (đ) 11
\textbardbl (‖) 20
\textbardotlessj (ɟ) 11
\textbarg (ɡ) 11
\textbarglotstop (ʔ) 11
\textbari (ɨ) 11
\textbarl (ɬ) 11
\textbaro (ɵ) 11
\textbarrevglotstop (ʕ) . . 11
\textbaru (ʉ) 11
\textbeltl (ɬ) 11
\textbenttailyogh (ʒ) 12
\textbeta (β) 11
\textbigcircle (◯) 20
\textbktailgamma (ɣ) 12
\textblank (␣) 20
\textblock (▉) 97
\textborn (⋆) 88
\textbottomtiebar (◽) 15
\textbraceleft ({) 9
\textbraceright (}) 9
\textbrevemacron (◽̆) 15
\textbrokenbar (¦) . . . 20, 116
\textbullet (•) 9, 20, 117
\textbullseye (ʘ) 11
\textcelsius (℃) 70, 117
\textceltpal (′) 11
\textcent (¢) 18, 116
\textcentoldstyle (¢) 18
\textchi (ʲ) 11
\textcircled (◽) 14
\textcircledP (℗) 19
\textcircumacute (◽́) 15
\textcircumdot (◽̇) 15
\textcloseepsilon (ɛ) 11
\textcloseomega (ω) 11
\textcloserevepsilon (ɜ) . . 11
\textcolonmonetary (₡) . . . 18
\textcommatailz (ʒ) 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 (ƀ) 11
\textcrd (đ) 11
\textcrd (đ) 14
\textcrg (ɡ) 11
\textcrh (ħ) 11
\textcrh (ħ) 14
\textcrinvglotstop (ʖ) . . . 11
\textcrlambda (ƛ) 11
\textcrtwo (ƻ) 11
\textctc (ȼ) 11
\textctd (ȡ) 11
\textctdctzlig (ȸ) 11
\textctesh (ʃ̢) 11
\textctinvglotstop (ʖ) . . . 12
\textctj (ʝ) 11
\textctjvar (ʝ) 12
\textctn (ɳ) 11
\textctstretchc (ʗ) 12
\textctstretchcvar (ɕ) . . . 12
\textctt (ŧ) 11
\textcttctclig (ŧȼ) 11
\textctturnt (ʇ) 12
\textctyogh (ʒ) 11
\textctz (ȥ) 11
\textcurrency (¤) . . . 18, 116
\textcypr 86
\textdagger (†) 9, 20
\textdaggerdbl (‡) 9, 20
\textdbend (⛲) 89
\textdblhyphen (=) 20
\textdblhyphenchar (=) 20
\textdblig (ȸ) 12
\textdctzlig (ȸ) 11
\textdegree (°) 67, 116
\textdied (†) 88
\textdiscount (٪) 20
\textdiv (÷) 67
\textdivorced (⚮) 88
\textdkshade (▓) 97
\textdnblock (▄) 97
\textdollar ($) 9, 18
\textdollaroldstyle ($) . . 18
\textdong (₫) 18
\textdotacute (◽̇) 15
\textdotbreve (◽̇) 15
\textdoublebaresh (ʬ) 11
\textdoublebarpipe (ǂ) . . . 11
\textdoublebarpipevar (ǂ) . 12
\textdoublebarslash (≠) . . 11
\textdoublegrave (◽̏) 15
\textdoublegrave (◽̏) 17
\textdoublepipe (‖) 11
\textdoublepipevar (‖) . . . 12
\textdoublevbaraccent (◽″) . 15
\textdoublevbaraccent (◽″) . 17
\textdoublevertline (‖) . . 11
\textdownarrow (↓) 41
\textdownfullarrow (↓) . . . 12
\textdownstep (˓) 11
\textdyoghlig (ʤ) 11
\textdzlig (ʣ) 11
\texteightoldstyle (8) . . . 20

\textellipsis (…) 9
\textemdash (—) 9
\textendash (–) 9
\textepsilon (ɛ) 11
\textepsilon (ɛ) 14
\textesh (ʃ) 12
\textesh (ʃ) 14
\textestimated (℮) 20
\texteuro (₠) 19
\texteuro (€) 18
\texteuro (€) . . . 18, 115, 117
\textexclamdown (¡) 9
\textfemale (♀) 12
\textfishhookr (ɾ) 12
\textfiveoldstyle (5) 20
\textfjlig (fj) 14
\textflorin (f) 18
\textfouroldstyle (4) 20
\textfractionsolidus (/) . . 67
\textfrak 68
\textfrbarn (ɲ) 12
\textfrhookd (ɗ) 12
\textfrhookdvar (ɖ) 12
\textfrhookt (ƭ) 12
\textfrtailgamma (ɣ) 12
\textg (g) 12
\textgamma (ɣ) 12
\textglobfall (↘) 12
\textglobrise (↗) 12
\textglotstop (ʔ) 11
\textglotstopvari (ʔ) 12
\textglotstopvarii (ʔ) . . . 12
\textglotstopvariii (ʔ) . . 12
\textgoth 68
\textgravecircum (◌̏) 15
\textgravedbl (◌̏) 18
\textgravedot (◌̀) 15
\textgravemacron (◌̀) 15
\textgravemid (◌̀) 15
\textgreater (>) 9, 114
\textgrgamma (γ) 12
\textguarani (₲) 18
\texthalflength (ː) 11
\texthardsign (ъ) 11
\textheng (ɧ) 12
\texthmlig (hm) 12
\texthooktop (◌̉) 11
\texthtb (ɓ) 11
\texthtb (ɓ) 14
\texthtbardotlessj (ʄ) 11
\texthtbardotlessjvar (ʄ) . 12
\texthtc (ƈ) 11
\texthtc (ƈ) 14
\texthtd (ɗ) 11
\texthtd (ɗ) 14
\texthtg (ɠ) 11
\texthth (ɦ) 11
\texththeng (ɧ) 11
\texthtk (ƙ) 11
\texthtk (ƙ) 14
\texthtp (ƥ) 11
\texthtp (ƥ) 14
\texthtq (ɋ) 11
\texthtrtaild (ɖ) 11
\texthtscg (ʗ) 11
\texthtt (ƫ) 11
\texthtt (ƫ) 14
\texthvlig (hv) 11
\textifsym 70
\textinterrobang (‽) 20
\textinterrobangdown (⸘) . . 20
\textinvglotstop (ɔ) 11
\textinvomega (ʊ) 12
\textinvsca (ʌ) 12
\textinvscr (ʁ) 11
\textinvscripta (ɑ) 12
\textinvsubbridge (◌̪) 15
\textiota (ι) 11
\textiota (ι) 14
\textlambda (λ) 11
\textlangle (⟨) 57, 114
\textlbrackdbl (⟦) 57
\textleaf (🍃) 88
\textleftarrow (←) 41
\textlengthmark (ː) 11
\textless (<) 9, 114
\textlfblock (▌) 97
\textlfishhookrlig (ɦ) . . . 12
\textlhdbend (⟙) 89
\textlhookfour (ɟ) 12
\textlhookp (ɒ) 12
\textlhookt (ƫ) 11
\textlhti (ɪ) 12
\textlhtlongi (ɭ) 11
\textlhtlongy (ɻ) 11
\textlinb 85, 86
\textlira (£) 18
\textlnot (¬) 67, 116
\textlonglegr (ɾ) 11
\textlooptoprevesh (ɭ) 12
\textlowering (◌̩) 15
\textlptr (ˁ) 11
\textlquill (⁅) 57
\textltailm (ɱ) 11
\textltailn (ɲ) 11
\textltailn (ɲ) 14
\textltilde (ɬ) 11
\textltshade (▒) 97
\textlyoghlig (ɮ) 11
\textmarried (⚭) 88
\textmho (℧) 70
\textmidacute (◌́) 15
\textminus (−) 67
\textmu (μ) 70, 116
\textmusicalnote (♪) 20
\textnaira (₦) 18
\textnineoldstyle (9) 20
\textnrleg (ɳ) 12
\textnumero (№) 20
\textObardotlessj (ɟ) 11
\textObullseye (⊙) 12
\textohm (Ω) 70
\textOlyoghlig (ɮ) 11
\textomega (ω) 11
\textonehalf (½) 67, 116
\textoneoldstyle 20
\textoneoldstyle (1) 20
\textonequarter (¼) . . 67, 116
\textonesuperior (¹) . 67, 116
\textopenbullet (○) 20
\textopencorner (◜) 11
\textopeno (ɔ) 11
\textopeno (ɔ) 14
\textordfeminine (ª) 9, 20, 116
\textordmasculine (º) . . 9, 20, 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 (ɸ) 11
\textpilcrow (⁋) 20
\textpipe (|) 11
\textpipe (|) 14
\textpipevar (|) 12
\textpm (±) 67, 116
\textpmhg 82
\textpolhook (◌̨) 15
\textprimstress (ˈ) 11
\textproto 81
\textqplig (ʠ) 12
\textquestiondown (¿) 9
\textquotedbl (") . . . 10, 114
\textquotedblleft (“) 9
\textquotedblright (”) 9
\textquoteleft (‘) 9
\textquoteright (’) 9
\textquotesingle (') . 20, 114
\textquotestraightbase (‚) 20
\textquotestraightdblbase („) 20
\textraiseglotstop (ʔ) . . . 11
\textraisevibyi (ꭎ) 11
\textraising (◌̝) 15
\textramshorns (ɤ) 11
\textrangle (⟩) 57, 114
\textrbrackdbl (⟧) 57
\textrecipe (℞) 20, 102
\textrectangle (▯) 12
\textreferencemark (※) 20, 21
\textregistered (®) 9, 19, 116
\textretracting (◌̞) 15
\textretractingvar (◌̠) . . . 12
\textrevapostrophe (ʻ) 11
\textreve (ɘ) 11
\textrevepsilon (ɜ) . . 11, 103
\textreversedvideodbend (⟘) 89
\textrevglotstop (ʕ) 11
\textrevscl (ɹ) 12

\textrevscr (ɹ) 12
\textrevyogh (ʒ) 11
\textrhooka (a) 12
\textrhooke (e) 12
\textrhookepsilon (ɛ) 12
\textrhookopeno (ɔ) 12
\textrhookrevepsilon (ɜ) . 12
\textrhookschwa (ɚ) 12
\textrhoticity (˞) 12
\textrightarrow (→) 41
\textringmacron (o) 15
\textroundcap (o) 15
\textrptr (ʳ) 12
\textrquill (}) 57
\textrtaild (d) 12
\textrtaild (d) 14
\textrtailhth (h) 12
\textrtaill (l) 12
\textrtailn (n) 11
\textrtailr (r) 11
\textrtails (s) 11
\textrtailt (t) 11
\textrtailt (t) 14
\textrtailz (z) 11
\textrtblock ( ) 97
\textrthook (ɻ) 11
\textrthooklong (ɻ) 12
\textsarab 87
\textsca (ᴀ) 11
\textscaolig (ꜳ) 12
\textscb (ʙ) 11
\textscdelta (ᴅ) 12
\textsce (ᴇ) 11
\textscf (ꜰ) 12
\textscg (ɢ) 11
\textsch (ʜ) 11
\textschwa (ə) 11
\textschwa (ᵊ) 14
\textsci (ɪ) 11
\textscj (ᴊ) 11
\textsck (ᴋ) 12
\textscl (ʟ) 11
\textscm (ᴍ) 12
\textscn (ɴ) 11
\textscoelig (ɶ) 11
\textscomega (ω) 11
\textscp (ᴘ) 12
\textscq (ǫ) 12
\textscr (ʀ) 11
\textscripta (ɑ) 11
\textscriptg (g) 11
\textscriptv (ʋ) 11
\textscriptv (ʃ) 14
\textscu (ᴜ) 11
\textscy (ʏ) 11
\textseagull (o) 15
\textsecstress (ˌ) 11
\textsection (§) 9, 20
\textservicemark (℠) 19
\textsevenoldstyle (7) . . . 20
\textSFi (┌) 97
\textSFii (└) 97
\textSFiii (┐) 97
\textSFiv (┘) 97
\textSFix (┤) 97
\textSFl (╘) 97
\textSFli (╒) 97
\textSFlii (╓) 97
\textSFliii (╫) 97
\textSFliv (╪) 97
\textSFv (┼) 97
\textSFvi (┬) 97
\textSFvii (┴) 97
\textSFviii (├) 97
\textSFx (─) 97
\textSFxi (│) 97
\textSFxix (╡) 97
\textSFxl (╩) 97
\textSFxli (╦) 97
\textSFxlii (╠) 97
\textSFxliii (=) 97
\textSFxliv (╬) 97
\textSFxlix (╚) 97
\textSFxlv (╧) 97
\textSFxlvi (╨) 97
\textSFxlvii (╤) 97
\textSFxlviii (╥) 97
\textSFxx (╫) 97
\textSFxxi (╖) 97
\textSFxxii (╕) 97
\textSFxxiii (╣) 97
\textSFxxiv (║) 97
\textSFxxv (╗) 97
\textSFxxvi (╝) 97
\textSFxxvii (╜) 97
\textSFxxviii (╛) 97
\textSFxxxix (╞) 97
\textSFxxxvi (╟) 97
\textSFxxxvii (╢) 97
\textSFxxxviii (╚) 97
\textshade (▒) 97
\textsixoldstyle (6) 20
\textsoftsign (ь) 11
\textspleftarrow (↼) 12
\textsterling (£) 9, 18
\textstretchc (ȼ) 11
\textstretchcvar (ɕ) 12
\textstyle 105, 106, 113
\textsubacute (o) 15
\textsubarch (o) 15
\textsubbar (o) 15
\textsubbridge (o) 15
\textsubcircum (o) 15
\textsubdot (o) 15
\textsubdoublearrow (↔) . . 12
\textsubgrave (o) 15
\textsublhalfring (o) 15
\textsubplus (o) 15
\textsubrhalfring (o) 15
\textsubrightarrow (→) . . . 12
\textsubring (o) 15
\textsubsquare (o) 15
\textsubtilde (o) 15
\textsubumlaut (o) 15
\textsubw (o) 16
\textsubwedge (o) 16
\textsuperimposetilde (o) . 16
\textsuperscript 16
\textsurd (√) 67
\textswab 68
\textsyllabic (o) 16
\texttctclig (ʨ) 11
\textteshlig (ʧ) 11
\textteshlig (ʧ) 14
\textttheta (θ) 11
\textthing (ϒ) 91
\textthorn (þ) 11
\textthornvari (þ) 12
\textthornvarii (þ) 12
\textthornvariii (þ) 12
\textthornvariv (þ) 12
\textthreeoldstyle (3) . . . 20
\textthreequarters (¾) 67, 116
\textthreequartersemdash (—) 20
\textthreesuperior (³) 67, 116
\texttildedot (o) 16
\texttildelow (∼) . . . 20, 115
\texttimes (×) 67
\texttoneletterstem (ǀ) . . . 11
\texttoptiebar (o) 16
\texttrademark (™) . 9, 19, 117
\texttslig (ʦ) 11
\textturna (ɐ) 11
\textturncelig (ɔɛ) 11
\textturnglotstop (ʔ) 12
\textturnh (ɥ) 11
\textturnk (ʞ) 11
\textturnlonglegr (ɿ) 11
\textturnm (ɯ) 11
\textturnmrleg (ɯ) 11
\textturnr (ɹ) 11
\textturnrrtail (ɻ) 11
\textturnsck (ʞ) 12
\textturnscripta (ɒ) 11
\textturnscu (ɔ) 12
\textturnt (ʇ) 11
\textturnthree (ɜ) 12
\textturntwo (ʅ) 12
\textturnv (ʌ) 11
\textturnw (ʍ) 11
\textturny (ʎ) 11
\texttwelveudash (—) 20
\texttwooldstyle 20
\texttwooldstyle (2) 20
\texttwosuperior (²) . 67, 116
\textuncrfemale (ọ) 12
\textunderscore (_) 9
\textuparrow (↑) 41
\textupblock (▀) 97
\textupfullarrow (↑) 12
\textupsilon (ʊ) 11
\textupstep (ꜛ) 11
\textvbaraccent (o) 16
\textvbaraccent (o) 17
\textvertline (|) 12
\textvibyi (ɻ) 12
\textvibyy (ɥ) 12

\textvisiblespace (␣) 9
\textwon (₩) 18
\textwynn (ƿ) 12
\textxswdown (⤫) 91
\textxswup (⤫) 91
\textyen (¥) 18, 116
\textyogh (ȝ) 12
\textyogh (ȝ) 14
\textzerooldstyle (o) 20
\TH (Þ) 10, 116
\th (þ) 10, 116
Thành, Hàn Thế́ 107
\therefore (∴) 32
\therefore (∴) 30, 64
\therefore (∴) 64
\Thermo 91
\Theta (Θ) 50
\theta (θ) 50
\thetaup (θ) 50
\thething (ϒ) 91
\thickapprox (≋) 30
\thicksim (∼) 30
\thickvert (|) 55
thin space 113
\ThinFog (▒) 91
\thinstar (⋆) 25
\third (‴) 66
thirty-second note . *see* musical symbols
\Thorn (Þ) 13
\thorn (þ) 13
\thorn (þ) 13
\thorn (þ) 13
thousandths . . . . . *see* \textperthousand
\threesim (≋) 104
tick . . . . . *see* check marks
tilde 9, 11, 13, 15–16, 18, 20, 57, 59, 61, 107, 115
  extensible 59, 61
  vertically centered . . . 115
\tilde (◌̃) 57, 107
\tildel (ŧ) 13
time of day 91, 92
\timelimit (⊕) 93
\times (×) 22
\times (×) 24
Times Roman (font) . . 18, 102
timing (package) 70
tipa (package) 11, 12, 14–17, 103, 119, 120
tipx (package) 12, 119, 120
\tndtstile (▒▒▒) 35
\tnststile (▒▒▒) 35
\tntstile (▒▒▒) 35
\tnttstile (▒▒▒) 35
\to . . . . . *see* \rightarrow
\ToBottom (⧩) 90
\tone 12
\top (⊤) 22, 51, 105
\top (⊤) 52
\topbot (⊥) 105, 107
\topdoteq (≒) 32
torus (𝕋) . *see* alphabets, math
\ToTop (⧨) 90
trademark . *see* \texttrademark
\TransformHoriz (⊶) 36
transforms 36, 63
\TransformVert (⥉) 36
transliteration
  semitic 14, 17
transliteration symbols 14
transpose 22
transversal intersection . . . *see* \pitchfork
trema (◌̈) . . . . . *see* accents
trfsigns (package) 36, 52, 63, 119
\triangle (△) 65
\triangle (△) 40
triangle relations 39, 40
\TriangleDown (▽) 79
\TriangleDown (▼ vs. ▽) . 101
\TriangleDown (▼) 80
\triangledown (▽) 66
\triangledown (▽) 40
\triangleeq (≜) 40
\TriangleLeft (◁) 79
\triangleleft (◁) 40
\triangleleft (◁) 22
\triangleleft (◁) 40
\trianglelefteq (⩤) 40
\trianglelefteq (⊴) 39
\trianglelefteq (⊴) . . . 39, 40
\trianglelefteqslant (⩤) . 40
\triangleq (≜) 21, 39
\triangleq (≜) 40
\TriangleRight (▷) 79
\triangleright (▷) 40
\triangleright (▷) 22
\triangleright (▷) 40
\trianglerighteq (⩥) 40
\trianglerighteq (⊵) 39
\trianglerighteq (⊵) . . 39, 40
\trianglerighteqslant (⩥) 40
triangles 66, 73, 79–80, 94
\TriangleUp (△) 79
\TriangleUp (▲ vs. △) . . . 101
\TriangleUp (▲) 80
\triple 57
\triplefrown (⩒) 48
\triplesim (≋) 33
\triplesmile (⩓) 48
trsym (package) . . . 36, 119, 120
\tsbm (⏑) 95
\tsdtstile (▒▒▒) 35
\tsmb (⏑) 95
\tsmm (⏑) 95
\tssstile (▒▒▒) 35
\Tsteel (⊤) 73
\tststile (▒▒▒) 35
\tsttstile (▒▒▒) 35
\ttdtstile (▒▒▒) 35
\TTsteel (⊥) 73
\ttststile (▒▒▒) 35
\tttstile (▒▒▒) 35
\ttttstile (▒▒▒) 35
TUGboat 59
\Tumbler (⧈) 90
turnstile (package) . 35, 119, 120
\TwelweStar (✹) 78
twiddle . . . . . *see* tilde
\twoheaddownarrow (↡) 43
\twoheadleftarrow (↞) . . . 41
\twoheadleftarrow (↞) . . . 44
\twoheadnearrow (↗) 44
\twoheadnwarrow (↖) 44
\twoheadrightarrow (↠) . . 41
\twoheadrightarrow (↠) . . 44
\twoheadsearrow (↘) 44
\twoheadswarrow (↙) 44
\twoheaduparrow (↟) 44
\twonotes (♫) 88
txfonts (package) 21–23, 27, 30, 31, 36–38, 41, 42, 48, 50–52, 65, 66, 68, 100, 102, 115, 119, 120
type1cm (package) 100
Type 1 (font) 112

U

\U (◌̆) 17
\U (◌̈) 14
\u (◌̆) 14
\UArrow (⇑) 72
\UB (⊰) 89
\ubar (ʉ) 13
\ubarbbrevis (◌͍) 95
\ubarbrevis (◌͎) 95
\ubarsbrevis (◌͍◌͍) 95
\ubrevislonga (◌͏) 95
ubulb.fd (file) 111, 112
ucs (package) 117, 118
\udesc (ɥ) 13
\udot (◌̇) 23
\udotdot (◌̈) 24, 64
\udots (◌̰) 64
\udtimes (⧖) 24
\UHORN (Ư) 10
\uhorn (ư) 10
\ulcorner (⌜) 53
\ulcorner (⌜) 53
\ulcorner (⌜) 55
\ullcorner (⌜) 55
\ulrcorner (⌝) 55
ulsy (package) . 24, 48, 103, 119
\Umd (◌̑) 89
umlaut (◌̈) . . . . . *see* accents

unary operators 21
\unclear (∞) 93
\underaccent 107
\underarc (▣) 17
\underarch (▣) 16
\underbrace (▣) 60
\underbrace (▣) 60
\underbrace (▣) 60
\underbrace (▣) 59
\underbracket (▣) 60
\underbracket (▣) . . . 108, 109
\underdots (▣) 18
\undergroup (▣) 60
\undergroup (▣) 60
\underleftarrow (▣) 59
\underleftharp (▣) 47
\underleftharpdown (▣) . . . 47
\underleftrightarrow (▣) 59
underline 9, 21, 59, 61
\underline (▣) 59
\underlinesegment (▣) 60
\underparenthesis (▣) 108, 109
\underrightarrow (▣) 59
\underrightharp (▣) 47
\underrightharpdown (▣) . . 47
\underring (▣) 18
underscore . . . . . *see* underline
underscore (package) 9
\underset 104
undertilde (package) 61, 119, 120
\undertilde (▣) 18
\underwedge (▣) 18
Unicode 8, 97, 117–118
union . . . . . *see* \cup
unit disk (𝔻) . . . *see* alphabets, math
\unitedpawns (○○) 93
units (package) 67
unity (𝟙) . . *see* alphabets, math
universa (package) . 80, 90, 119, 120
universal (package) 75, 77, 80, 90, 119, 120
\unlhd (⊴) 22, 23
\unlhd (⊴) 39, 40
\unrhd (⊵) 22, 23
\unrhd (⊵) 39, 40
\upalpha (α) 51
\UParrow (▲) 88
\Uparrow (⇑) 41, 54
\Uparrow (⇑) 44
\uparrow (↑) 41, 54, 100
\uparrow (↑) 44
\uparrowtail (↥) 44
\upbar 16
\upbeta (β) 51
\upbracketfill 109
\upchi (χ) 51
\Updelta (Δ) 51
\updelta (δ) 51
\Updownarrow (⇕) 41, 54
\Updownarrow (⇕) 44
\updownarrow (↕) 41, 54
\updownarrow (↕) 44
\updownarrows (↑↓) 42
\updownarrows (⇅) 44
\updownharpoonleftright (↨) 46
\updownharpoonrightleft (↨) 46
\updownharpoons (↿⇂) 43
\updownharpoons (↿⇂) 46
\Updownline (‖) 33
\updownline (|) 33
\upepsilon (ε) 51
\upeta (η) 51
\upfilledspoon (▼) 47
\upfootline (⊤) 33
\upfree (⊤) 33
\Upgamma (Γ) 51
\upgamma (γ) 51
upgreek (package) . 51, 119, 120
\upharpoonccw (↿) 46
\upharpooncw (↾) 46
\upharpoonleft (↿) 43
\upharpoonleft (↿) 41
\upharpoonright (↾) 43
\upharpoonright (↾) 41
\upiota (ι) 51
\upkappa (κ) 51
\Uplambda (Λ) 51
\uplambda (λ) 51
\uplett 16
\uplsquigarrow (⇝) 44
\uplus (⊎) 23
\uplus (⊎) 22
\uplus (⊎) 24
\upmapsto (↥) 44
\upModels (⫫) 33
\upmodels (⫫) 33
\upmu (μ) 51
\upnu (ν) 51
\Upomega (Ω) 51
\upomega (ω) 51
\upp (˄) 18
\upparenthfill 109
\Upphi (Φ) 51
\upphi (ϕ) 51
\Uppi (Π) 51
\uppi (π) 51
\uppitchfork (⫛) 47
\uppropto (∝) 33
\Uppsi (Ψ) 51
\uppsi (ψ) 51
upquote (package) 115
\uprho (ρ) 51
upright Greek letters . . . 50, 51
\uprsquigarrow (⇜) 44
upside-down symbols 114
upside-down symbols 11–13, 17, 103
\Upsigma (Σ) 51
\upsigma (σ) 51
\Upsilon (Υ) 50
\upsilon (υ) 50
\upsilonup (υ) 50
\upslice (△) 25
\upspoon (▼) 47
\upt (⊥) 18
\uptau (τ) 51
\uptherefore (∴) 24, 64
\Uptheta (Θ) 51
\uptheta (θ) 51
\uptodownarrow (↕) 42
\upuparrows (↑↑) 42
\upuparrows (↑↑) 41
\upuparrows (↑↑) 44
\upupharpoons (↾↾) 43
\Upupsilon (Υ) 51
\upupsilon (υ) 51
\upvarepsilon (ε) 51
\upvarphi (φ) 51
\upvarpi (ϖ) 51
\upvarrho (ρ) 51
\upvarsigma (σ) 51
\upvartheta (ϑ) 51
\upVdash (⊩) 33
\upvdash (⊢) 33
\Upxi (Ξ) 51
\upxi (ξ) 51
\upY (ˬ) 24
\upzeta (ζ) 51
\Uranus (♅) 71
\Uranus (♅) 71
\uranus (♅) 71
\urcorner (⌝) 53
\urcorner (⌝) 53
\urcorner (▣) 55
url (package) 115
\US (▼) 72
\usepackage 8
ushort (package) . . 61, 119, 121
\ushort (▣) 61
\ushortdw (▣) 61
\ushortw (▣) 61
\ut (▣) 16
UTF-8 . . . . . 117, 118
utf8x (inputenc package option) 117
\utilde (▣) 61
\utimes (⨱) 24
\utimes (×) 24
Utopia (font) 18, 30

V

\v (▣) 14
\vara (𝔞) 13
\varangle (∢) 66
\varbigcirc (◯) 22
\VarClock (🕐) 91
\varclub (♧) 67
\varclubsuit (♧) 66
\varcoppa (ϟ) 87
\varcurlyvee (⋎) 22

\varcurlywedge (⋏) 22
\vardiamond (⧫) 67
\vardiamondsuit (♦) 66
\varEarth (🜨) 71
\varepsilon (ε) 50
\varepsilonup (ε) 50
\VarFlag (⚑) 91
varg (txfonts/pxfonts package option) 51
\varg (ɡ) 51
\varg (g) 13
\vargeq (≥) 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 (⨍) 26
\various (R) 93
\varkappa (ϰ) 50
\varleq (≤) 38
\varliminf (lim) 49
\varlimsup (lim) 49
\varmathbb 68
\VarMountain (⛰) 91
\varnothing (∅) 21, 65, 66
\varnothing (∅) 66
\varnotin (∉) 52
\varnotowner (∌) 52
\varoast (⊛) 22
\varobar (⍜) 22
\varobslash (⦸) 22
\varocircle (⊚) 22
\varodot (⊙) 22
\varogreaterthan (⧁) 22
\varoiiintclockwise (∱) . 27
\varoiiintctrclockwise (∰) 28
\varoiint (∯) 28
\varoiintclockwise (∲) . . 28
\varoiintctrclockwise (∳) 28
\varoint (∮) 26
\varointclockwise (∲) 28
\varointclockwise (∲) 28
\varointctrclockwise (∳) . 28
\varointctrclockwise (∳) . . 28
\varolessthan (⧀) 22
\varomega (ω) 13
\varominus (⊖) 22
\varopeno (ɔ) 13
\varoplus (⊕) 22
\varoslash (⊘) 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
\varpropto (∝) 30
\varpropto (∝) 33
\varQ (Q) 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 (ϛ) 87
\varsubsetneq (⫋) 37
\varsubsetneq (⊊) 36
\varsubsetneq (⫋) 37
\varsubsetneqq (⫋) 37
\varsubsetneqq (⊊) 36
\varsubsetneqq (⫋) 37
\VarSummit (△) 91
\varsupsetneq (⫌) 37
\varsupsetneq (⊋) 36
\varsupsetneq (⫌) 37
\varsupsetneqq (⫌) 37
\varsupsetneqq (⫌) 36
\varsupsetneqq (⫌) 37
\VarTaschenuhr (⏱) 91
\vartheta (ϑ) 50
\varthetaup (ϑ) 50
\vartimes (⨯) 22
\vartriangle (△) 66
\vartriangle (△) 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
\vbipropto (∝) 24
\vcentcolon (:) 34
\vcenter 104
\vcrossing (x) 33
\VDash (⊫) 32
\VDash (⊫) 33
\Vdash (⊩) 32
\Vdash (⊩) 30
\Vdash (⊩) 33
\vDash (⊨) 32
\vDash (⊨) 30
\vDash (⊨) 33
\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 (♈) 71
versicle (℣) 118
\VERT (‖) 57
\Vert (‖) 54, 56
\vert (|) 54, 56
\vertbowtie (⧓) 24
\vertdiv (⨪) 24
\VHF (≋) 70
\Vier (𝅘𝅥) 89
vietnam (package) 119
\Village (⌂⌂⌂) 91
\vin (⌟) 53
vinculum . . . . . *see* \overline
\ViPa (ɪ) 89
\Virgo (♍) 71
\virgo (♍) 71
\VM (>) 89
vntex (package) 10, 14
\vod (v) 13
\voicedh (ɦ) 13
\vppm (ɹ) 95
\vpppm (i) 95
\vrule 97
\VT (♂) 72
\vv (⃗) 61
\VvDash (⊪) 31
\Vvdash (⊪) 32
\Vvdash (⊪) 30
\Vvdash (⊪) 33
\vvvert (‖) 55

W

\WashCotton (🛁) 90
\WashSynthetics (🛁) 90

\WashWool (🛁) 90
\wasylozenge (⌑) 88
\wasypropto (∝) 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
\wasytherefore (∴) 64
wavy-line delimiters 55, 56
\wbetter (±) 93
\wdecisive (+−) 93
\weakpt (×) 93
\WeakRain (🌧) 91
\WeakRainCloud (⛈) 91
weather symbols 91
\Wecker (🕗) 91
\wedge (∧) 23
\wedge (∧) 22
\wedge (∧) 24
\wedgedot (⟑) 24
Weierstrass ℘ function . *see* \wp
\wfermion (⋌) 74
\Wheelchair (♿) 90
\whfermion (⩒) 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 (ˇ) 60
\widehat (̂) 60
\widehat (̂) 59
\wideOarc (◠) 60
\wideparen (⏜) 60
\wideparen (⏜) 60
\wideparen (⏜) 59
\widering (̊) 60
\widering (̊) 60
\widering (̊) 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 (℘) 51
\wp (℘) 52
\wr (≀) 22
\wr (≀) 24
\wreath (≀) 24
wreath product . . . . . *see* \wr
\Writinghand (✍) 90
wsuipa (package) 13, 16, 18, 101, 103, 107, 119, 120
\wupperhand (±) 93

X

\x (ϑ) 65
\x (::) 95
\XBox (⊠) 77
Xdvi 47, 103
XeLaTeX 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
\xrightharpoondown (⇁) . . 62
\xrightharpoonup (⇀) 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 (ϒ) 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 (ϒ) 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 (𝅘𝅥𝅯𝄾) 89