

# The Comprehensive L<sup>A</sup>T<sub>E</sub>X Symbol List

Scott Pakin <[scott+clsl@pakin.org](mailto:scott+clsl@pakin.org)><sup>\*</sup>

9 November 2009

## Abstract

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

## Contents

<b>Contents</b>	<b>1</b>
<b>1 Introduction</b>	<b>9</b>
1.1 Document Usage . . . . .	9
1.2 Frequently Requested Symbols . . . . .	9
<b>2 Body-text symbols</b>	<b>10</b>
Table 1: L <sup>A</sup> T <sub>E</sub> X 2 $\epsilon$ Escapable “Special” Characters . . . . .	10
Table 2: Predefined L <sup>A</sup> T <sub>E</sub> X 2 $\epsilon$ Text-mode Commands . . . . .	10
Table 3: L <sup>A</sup> T <sub>E</sub> X 2 $\epsilon$ Commands Defined to Work in Both Math and Text Mode . . . . .	10
Table 4: <i>AMS</i> Commands Defined to Work in Both Math and Text Mode . . . . .	11
Table 5: Non-ASCII Letters (Excluding Accented Letters) . . . . .	11
Table 6: Letters Used to Typeset African Languages . . . . .	11
Table 7: Letters Used to Typeset Vietnamese . . . . .	11
Table 8: Punctuation Marks Not Found in OT1 . . . . .	11
Table 9: pifont Decorative Punctuation Marks . . . . .	12
Table 10: tipa Phonetic Symbols . . . . .	12
Table 11: tipx Phonetic Symbols . . . . .	13
Table 12: wsipa Phonetic Symbols . . . . .	14
Table 13: wasysym Phonetic Symbols . . . . .	14
Table 14: phonetic Phonetic Symbols . . . . .	15
Table 15: t4phonet Phonetic Symbols . . . . .	15
Table 16: semtrans Transliteration Symbols . . . . .	15
Table 17: Text-mode Accents . . . . .	16
Table 18: tipa Text-mode Accents . . . . .	16
Table 19: extraipa Text-mode Accents . . . . .	18
Table 20: wsipa Text-mode Accents . . . . .	18
Table 21: phonetic Text-mode Accents . . . . .	18
Table 22: metre Text-mode Accents . . . . .	18
Table 23: t4phonet Text-mode Accents . . . . .	19

<sup>\*</sup>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 129](#) for more information about who did what.

Table 24: <code>arcs</code> Text-mode Accents . . . . .	19
Table 25: <code>semtrans</code> Accents . . . . .	19
Table 26: <code>ogonek</code> Accents . . . . .	19
Table 27: <code>combelow</code> Accents . . . . .	19
Table 28: <code>w sui pa</code> Diacritics . . . . .	20
Table 29: <code>textcomp</code> Diacritics . . . . .	20
Table 30: <code>textcomp</code> Currency Symbols . . . . .	20
Table 31: <code>marvosym</code> Currency Symbols . . . . .	20
Table 32: <code>wasysym</code> Currency Symbols . . . . .	20
Table 33: <code>GrFA2e</code> Currency Symbols . . . . .	21
Table 34: <code>teubner</code> Currency Symbols . . . . .	21
Table 35: <code>eurosym</code> Euro Signs . . . . .	21
Table 36: <code>fourier</code> Euro Signs . . . . .	21
Table 37: <code>textcomp</code> Legal Symbols . . . . .	21
Table 38: <code>cclICENSES</code> Creative Commons License Icons . . . . .	21
Table 39: <code>textcomp</code> Old-style Numerals . . . . .	22
Table 40: Miscellaneous <code>textcomp</code> Symbols . . . . .	22
Table 41: Miscellaneous <code>wasysym</code> Text-mode Symbols . . . . .	22

### 3 Mathematical symbols 23

Table 42: Math-Mode Versions of Text Symbols . . . . .	23
Table 43: <code>cml l</code> Unary Operators . . . . .	23
Table 44: Binary Operators . . . . .	24
Table 45: <i>AMS</i> Binary Operators . . . . .	24
Table 46: <code>stmaryrd</code> Binary Operators . . . . .	25
Table 47: <code>wasysym</code> Binary Operators . . . . .	25
Table 48: <code>txfonts/pxfonts</code> Binary Operators . . . . .	25
Table 49: <code>mathabx</code> Binary Operators . . . . .	26
Table 50: <code>MnSymbol</code> Binary Operators . . . . .	26
Table 51: <code>mathdesign</code> Binary Operators . . . . .	27
Table 52: <code>cml l</code> Binary Operators . . . . .	27
Table 53: <code>shuffle</code> Binary Operators . . . . .	27
Table 54: <code>ul sy</code> Geometric Binary Operators . . . . .	27
Table 55: <code>mathabx</code> Geometric Binary Operators . . . . .	28
Table 56: <code>MnSymbol</code> Geometric Binary Operators . . . . .	28
Table 57: Variable-sized Math Operators . . . . .	29
Table 58: <i>AMS</i> Variable-sized Math Operators . . . . .	29
Table 59: <code>stmaryrd</code> Variable-sized Math Operators . . . . .	29
Table 60: <code>wasysym</code> Variable-sized Math Operators . . . . .	29
Table 61: <code>mathabx</code> Variable-sized Math Operators . . . . .	30
Table 62: <code>txfonts/pxfonts</code> Variable-sized Math Operators . . . . .	31
Table 63: <code>esint</code> Variable-sized Math Operators . . . . .	32
Table 64: <code>MnSymbol</code> Variable-sized Math Operators . . . . .	32
Table 65: <code>mathdesign</code> Variable-sized Math Operators . . . . .	33
Table 66: <code>cml l</code> Large Math Operators . . . . .	33
Table 67: Binary Relations . . . . .	34
Table 68: <i>AMS</i> Binary Relations . . . . .	34
Table 69: <i>AMS</i> Negated Binary Relations . . . . .	34
Table 70: <code>stmaryrd</code> Binary Relations . . . . .	34
Table 71: <code>wasysym</code> Binary Relations . . . . .	35
Table 72: <code>txfonts/pxfonts</code> Binary Relations . . . . .	35
Table 73: <code>txfonts/pxfonts</code> Negated Binary Relations . . . . .	35
Table 74: <code>mathabx</code> Binary Relations . . . . .	36
Table 75: <code>mathabx</code> Negated Binary Relations . . . . .	36

Table 76: MnSymbol Binary Relations . . . . .	36
Table 77: MnSymbol Negated Binary Relations . . . . .	38
Table 78: mathtools Binary Relations . . . . .	39
Table 79: turnstile Binary Relations . . . . .	39
Table 80: trsym Binary Relations . . . . .	40
Table 81: trfsigns Binary Relations . . . . .	40
Table 82: cmll Binary Relations . . . . .	40
Table 83: colonequals Binary Relations . . . . .	41
Table 84: fourier Binary Relations . . . . .	41
Table 85: Subset and Superset Relations . . . . .	41
Table 86: <i>AMS</i> Subset and Superset Relations . . . . .	41
Table 87: stmaryrd Subset and Superset Relations . . . . .	41
Table 88: wasysym Subset and Superset Relations . . . . .	41
Table 89: txfonts/pxfonts Subset and Superset Relations . . . . .	41
Table 90: mathabx Subset and Superset Relations . . . . .	42
Table 91: MnSymbol Subset and Superset Relations . . . . .	42
Table 92: Inequalities . . . . .	42
Table 93: <i>AMS</i> Inequalities . . . . .	43
Table 94: wasysym Inequalities . . . . .	43
Table 95: txfonts/pxfonts Inequalities . . . . .	43
Table 96: mathabx Inequalities . . . . .	44
Table 97: MnSymbol Inequalities . . . . .	45
Table 98: <i>AMS</i> Triangle Relations . . . . .	46
Table 99: stmaryrd Triangle Relations . . . . .	46
Table 100: mathabx Triangle Relations . . . . .	46
Table 101: MnSymbol Triangle Relations . . . . .	47
Table 102: Arrows . . . . .	47
Table 103: Harpoons . . . . .	48
Table 104: textcomp Text-mode Arrows . . . . .	48
Table 105: <i>AMS</i> Arrows . . . . .	48
Table 106: <i>AMS</i> Negated Arrows . . . . .	48
Table 107: <i>AMS</i> Harpoons . . . . .	48
Table 108: stmaryrd Arrows . . . . .	48
Table 109: txfonts/pxfonts Arrows . . . . .	49
Table 110: mathabx Arrows . . . . .	49
Table 111: mathabx Negated Arrows . . . . .	49
Table 112: mathabx Harpoons . . . . .	49
Table 113: MnSymbol Arrows . . . . .	50
Table 114: MnSymbol Negated Arrows . . . . .	51
Table 115: MnSymbol Harpoons . . . . .	53
Table 116: MnSymbol Negated Harpoons . . . . .	53
Table 117: harpoon Extensible Harpoons . . . . .	54
Table 118: chemarrow Arrows . . . . .	54
Table 119: fge Arrows . . . . .	54
Table 120: MnSymbol Spoons . . . . .	54
Table 121: MnSymbol Pitchforks . . . . .	54
Table 122: MnSymbol Smiles and Frowns . . . . .	55
Table 123: ulsy Contradiction Symbols . . . . .	55
Table 124: Extension Characters . . . . .	55
Table 125: stmaryrd Extension Characters . . . . .	55
Table 126: txfonts/pxfonts Extension Characters . . . . .	55
Table 127: mathabx Extension Characters . . . . .	56
Table 128: Log-like Symbols . . . . .	56
Table 129: <i>AMS</i> Log-like Symbols . . . . .	56

Table 130: <i>GfNA2e</i> Number Sets . . . . .	56
Table 131: Greek Letters . . . . .	57
Table 132: <i>AMS</i> Greek Letters . . . . .	57
Table 133: <i>txfonts/pxfonts</i> Upright Greek Letters . . . . .	57
Table 134: <i>upgreek</i> Upright Greek Letters . . . . .	58
Table 135: <i>fourier</i> Variant Greek Letters . . . . .	58
Table 136: <i>txfonts/pxfonts</i> Variant Latin Letters . . . . .	58
Table 137: <i>AMS</i> Hebrew Letters . . . . .	58
Table 138: <i>MnSymbol</i> Hebrew Letters . . . . .	58
Table 139: Letter-like Symbols . . . . .	59
Table 140: <i>AMS</i> Letter-like Symbols . . . . .	59
Table 141: <i>txfonts/pxfonts</i> Letter-like Symbols . . . . .	59
Table 142: <i>mathabx</i> Letter-like Symbols . . . . .	59
Table 143: <i>MnSymbol</i> Letter-like Symbols . . . . .	59
Table 144: <i>trfsigns</i> Letter-like Symbols . . . . .	59
Table 145: <i>mathdesign</i> Letter-like Symbols . . . . .	60
Table 146: <i>fge</i> Letter-like Symbols . . . . .	60
Table 147: <i>fourier</i> Letter-like Symbols . . . . .	60
Table 148: <i>AMS</i> Delimiters . . . . .	60
Table 149: <i>stmaryrd</i> Delimiters . . . . .	60
Table 150: <i>mathabx</i> Delimiters . . . . .	60
Table 151: <i>nath</i> Delimiters . . . . .	60
Table 152: Variable-sized Delimiters . . . . .	61
Table 153: Large, Variable-sized Delimiters . . . . .	61
Table 154: <i>AMS</i> Variable-sized Delimiters . . . . .	61
Table 155: <i>stmaryrd</i> Variable-sized Delimiters . . . . .	62
Table 156: <i>mathabx</i> Variable-sized Delimiters . . . . .	62
Table 157: <i>MnSymbol</i> Variable-sized Delimiters . . . . .	62
Table 158: <i>mathdesign</i> Variable-sized Delimiters . . . . .	63
Table 159: <i>nath</i> Variable-sized Delimiters (Double) . . . . .	64
Table 160: <i>nath</i> Variable-sized Delimiters (Triple) . . . . .	64
Table 161: <i>fourier</i> Variable-sized Delimiters . . . . .	64
Table 162: <i>textcomp</i> Text-mode Delimiters . . . . .	65
Table 163: <i>metre</i> Text-mode Delimiters . . . . .	65
Table 164: Math-mode Accents . . . . .	65
Table 165: <i>AMS</i> Math-mode Accents . . . . .	65
Table 166: <i>MnSymbol</i> Math-mode Accents . . . . .	65
Table 167: <i>fge</i> Math-mode Accents . . . . .	65
Table 168: <i>yhmath</i> Math-mode Accents . . . . .	66
Table 169: Extensible Accents . . . . .	66
Table 170: <i>overrightarrow</i> Extensible Accents . . . . .	66
Table 171: <i>yhmath</i> Extensible Accents . . . . .	66
Table 172: <i>AMS</i> Extensible Accents . . . . .	67
Table 173: <i>MnSymbol</i> Extensible Accents . . . . .	67
Table 174: <i>mathtools</i> Extensible Accents . . . . .	67
Table 175: <i>mathabx</i> Extensible Accents . . . . .	67
Table 176: <i>fourier</i> Extensible Accents . . . . .	68
Table 177: <i>esvect</i> Extensible Accents . . . . .	68
Table 178: <i>undertilde</i> Extensible Accents . . . . .	68
Table 179: <i>ushort</i> Extensible Accents . . . . .	68
Table 180: <i>AMS</i> Extensible Arrows . . . . .	68
Table 181: <i>mathtools</i> Extensible Arrows . . . . .	69
Table 182: <i>chemarr</i> Extensible Arrows . . . . .	69
Table 183: <i>chemarrow</i> Extensible Arrows . . . . .	69

Table 184: <code>extarrows</code> Extensible Arrows . . . . .	69
Table 185: <code>extpfeil</code> Extensible Arrows . . . . .	70
Table 186: <code>DotArrow</code> Extensible Arrows . . . . .	70
Table 187: <code>trfsigns</code> Extensible Transform Symbols . . . . .	70
Table 188: <code>holtpolt</code> Non-commutative Division Symbols . . . . .	70
Table 189: Dots . . . . .	70
Table 190: $\mathcal{AM}$ S Dots . . . . .	71
Table 191: <code>wasysym</code> Dots . . . . .	71
Table 192: <code>MnSymbol</code> Dots . . . . .	71
Table 193: <code>mathdots</code> Dots . . . . .	71
Table 194: <code>yhmath</code> Dots . . . . .	71
Table 195: <code>teubner</code> Dots . . . . .	72
Table 196: <code>mathcomp</code> Math Symbols . . . . .	72
Table 197: <code>marvosym</code> Digits . . . . .	72
Table 198: <code>fge</code> Digits . . . . .	72
Table 199: dozenal Base-12 Digits . . . . .	72
Table 200: <code>mathabx</code> Mayan Digits . . . . .	72
Table 201: Miscellaneous L <sup>A</sup> T <sub>E</sub> X 2 <sub>E</sub> Math Symbols . . . . .	73
Table 202: Miscellaneous $\mathcal{AM}$ S Math Symbols . . . . .	73
Table 203: Miscellaneous <code>wasysym</code> Math Symbols . . . . .	73
Table 204: Miscellaneous <code>txfonts/pxfonts</code> Math Symbols . . . . .	73
Table 205: Miscellaneous <code>mathabx</code> Math Symbols . . . . .	73
Table 206: Miscellaneous <code>MnSymbol</code> Math Symbols . . . . .	74
Table 207: Miscellaneous Internal <code>MnSymbol</code> Math Symbols . . . . .	74
Table 208: Miscellaneous <code>textcomp</code> Text-mode Math Symbols . . . . .	74
Table 209: Miscellaneous <code>marvosym</code> Math Symbols . . . . .	74
Table 210: Miscellaneous <code>fge</code> Math Symbols . . . . .	75
Table 211: Miscellaneous <code>mathdesign</code> Math Symbols . . . . .	75
Table 212: Miscellaneous <code>arev</code> Math Symbols . . . . .	75
Table 213: Math Alphabets . . . . .	76
<b>4 Science and technology symbols</b> . . . . .	78
Table 214: <code>gensymb</code> Symbols Defined to Work in Both Math and Text Mode . . . . .	78
Table 215: <code>wasysym</code> Electrical and Physical Symbols . . . . .	78
Table 216: <code>ifsym</code> Pulse Diagram Symbols . . . . .	78
Table 217: <code>ar</code> Aspect Ratio Symbol . . . . .	78
Table 218: <code>textcomp</code> Text-mode Science and Engineering Symbols . . . . .	78
Table 219: <code>steinmetz</code> Extensible Phasor Symbol . . . . .	79
Table 220: <code>wasysym</code> Astronomical Symbols . . . . .	79
Table 221: <code>marvosym</code> Astronomical Symbols . . . . .	79
Table 222: <code>mathabx</code> Astronomical Symbols . . . . .	79
Table 223: <code>wasysym</code> APL Symbols . . . . .	80
Table 224: <code>wasysym</code> APL Modifiers . . . . .	80
Table 225: <code>marvosym</code> Computer Hardware Symbols . . . . .	80
Table 226: <code>keystroke</code> Computer Keys . . . . .	80
Table 227: <code>ascii</code> Control Characters (CP437) . . . . .	81
Table 228: <code>milstd</code> Logic Gates . . . . .	81
Table 229: <code>marvosym</code> Communication Symbols . . . . .	82
Table 230: <code>marvosym</code> Engineering Symbols . . . . .	82
Table 231: <code>wasysym</code> Biological Symbols . . . . .	82
Table 232: <code>marvosym</code> Biological Symbols . . . . .	82
Table 233: <code>marvosym</code> Safety-related Symbols . . . . .	82
Table 234: <code>feyn</code> Feynman Diagram Symbols . . . . .	83

<b>5 Dingbats</b>	<b>84</b>
Table 235: bbdng Arrows . . . . .	84
Table 236: pifont Arrows . . . . .	84
Table 237: universal Arrows . . . . .	84
Table 238: marvosym Scissors . . . . .	84
Table 239: bbdng Scissors . . . . .	84
Table 240: pifont Scissors . . . . .	85
Table 241: dingbat Pencils . . . . .	85
Table 242: bbdng Pencils and Nibs . . . . .	85
Table 243: pifont Pencils and Nibs . . . . .	85
Table 244: dingbat Fists . . . . .	85
Table 245: bbdng Fists . . . . .	85
Table 246: pifont Fists . . . . .	85
Table 247: fourier Fists . . . . .	85
Table 248: bbdng Crosses and Plusses . . . . .	86
Table 249: pifont Crosses and Plusses . . . . .	86
Table 250: bbdng Xs and Check Marks . . . . .	86
Table 251: pifont Xs and Check Marks . . . . .	86
Table 252: wasysym Xs and Check Marks . . . . .	86
Table 253: universal Xs . . . . .	86
Table 254: pifont Circled Numbers . . . . .	87
Table 255: wasysym Stars . . . . .	87
Table 256: bbdng Stars, Flowers, and Similar Shapes . . . . .	87
Table 257: pifont Stars, Flowers, and Similar Shapes . . . . .	88
Table 258: fourier Ornaments . . . . .	88
Table 259: wasysym Geometric Shapes . . . . .	88
Table 260: MnSymbol Geometric Shapes . . . . .	88
Table 261: ifsym Geometric Shapes . . . . .	89
Table 262: bbdng Geometric Shapes . . . . .	89
Table 263: pifont Geometric Shapes . . . . .	90
Table 264: universa Geometric Shapes . . . . .	90
Table 265: universal Geometric Shapes . . . . .	90
Table 266: Miscellaneous dingbat Dingbats . . . . .	90
Table 267: Miscellaneous bbdng Dingbats . . . . .	90
Table 268: Miscellaneous pifont Dingbats . . . . .	90
<b>6 Ancient languages</b>	<b>91</b>
Table 269: phaistos Symbols from the Phaistos Disk . . . . .	91
Table 270: protosem Proto-Semitic Characters . . . . .	91
Table 271: hierogl1f Hieroglyphics . . . . .	92
Table 272: linearA Linear A Script . . . . .	92
Table 273: linearb Linear B Basic and Optional Letters . . . . .	95
Table 274: linearb Linear B Numerals . . . . .	95
Table 275: linearb Linear B Weights and Measures . . . . .	95
Table 276: linearb Linear B Ideograms . . . . .	96
Table 277: linearb Unidentified Linear B Symbols . . . . .	96
Table 278: cypriot Cypriot Letters . . . . .	96
Table 279: sarabian South Arabian Letters . . . . .	97
Table 280: teubner Archaic Greek Letters and Greek Numerals . . . . .	97

<b>7 Other symbols</b>	<b>98</b>
Table 281: <code>textcomp</code> Genealogical Symbols . . . . .	98
Table 282: <code>wasymp</code> General Symbols . . . . .	98
Table 283: <code>wasymp</code> Circles . . . . .	98
Table 284: <code>wasymp</code> Musical Symbols . . . . .	98
Table 285: <code>arev</code> Musical Symbols . . . . .	98
Table 286: <code>harmony</code> Musical Symbols . . . . .	99
Table 287: <code>harmony</code> Musical Accents . . . . .	99
Table 288: <code>manfnt</code> Dangerous Bend Symbols . . . . .	99
Table 289: Miscellaneous <code>manfnt</code> Symbols . . . . .	100
Table 290: <code>marvosym</code> Navigation Symbols . . . . .	100
Table 291: <code>marvosym</code> Laundry Symbols . . . . .	100
Table 292: <code>marvosym</code> Information Symbols . . . . .	100
Table 293: Other <code>marvosym</code> Symbols . . . . .	101
Table 294: Miscellaneous <code>universa</code> Symbols . . . . .	101
Table 295: Miscellaneous <code>universal</code> Symbols . . . . .	101
Table 296: Miscellaneous <code>fourier</code> Symbols . . . . .	101
Table 297: <code>ifsym</code> Weather Symbols . . . . .	101
Table 298: <code>ifsym</code> Alpine Symbols . . . . .	102
Table 299: <code>ifsym</code> Clocks . . . . .	102
Table 300: Other <code>ifsym</code> Symbols . . . . .	102
Table 301: <code>clock</code> Clocks . . . . .	102
Table 302: <code>epsdice</code> Dice . . . . .	103
Table 303: <code>hhcount</code> Dice . . . . .	103
Table 304: <code>hhcount</code> Tally Markers . . . . .	103
Table 305: <code>skull</code> Symbols . . . . .	103
Table 306: Non-Mathematical <code>mathabx</code> Symbols . . . . .	103
Table 307: <code>skak</code> Chess Informator Symbols . . . . .	104
Table 308: <code>skak</code> Chess Pieces and Chessboard Squares . . . . .	104
Table 309: <code>igo</code> Go Stones . . . . .	105
Table 310: <code>metre</code> Metrical Symbols . . . . .	105
Table 311: <code>metre</code> Small and Large Metrical Symbols . . . . .	105
Table 312: <code>teubner</code> Metrical Symbols . . . . .	106
Table 313: <code>dictsym</code> Dictionary Symbols . . . . .	106
Table 314: <code>simpsons</code> Characters from <i>The Simpsons</i> . . . . .	106
Table 315: <code>pmboxdraw</code> Box-Drawing Symbols . . . . .	107
Table 316: <code>staves</code> Magical Staves . . . . .	107
Table 317: <code>pigpen</code> Cipher Symbols . . . . .	108
Table 318: <code>QFA2e</code> Phases of the Moon . . . . .	108
Table 319: Other <code>QFA2e</code> Symbols . . . . .	109
Table 320: <code>recycle</code> Recycling Symbols . . . . .	109
<b>8 Additional Information</b>	<b>110</b>
8.1 Symbol Name Clashes . . . . .	110
8.2 Resizing symbols . . . . .	110
8.3 Where can I find the symbol for ... ? . . . . .	113
8.4 Math-mode spacing . . . . .	123
8.5 Bold mathematical symbols . . . . .	123
8.6 ASCII and Latin 1 quick reference . . . . .	124
8.7 Unicode characters . . . . .	126
8.8 About this document . . . . .	129
8.9 Copyright and license . . . . .	132
<b>References</b>	<b>133</b>



# 1 Introduction

Welcome to the Comprehensive L<sup>A</sup>T<sub>E</sub>X Symbol List! This document strives to be your primary source of L<sup>A</sup>T<sub>E</sub>X symbol information: font samples, L<sup>A</sup>T<sub>E</sub>X commands, packages, usage details, caveats—everything needed to put thousands of different symbols at your disposal. All of the fonts covered herein meet the following criteria:

1. They are freely available from the Comprehensive T<sub>E</sub>X Archive Network (<http://www.ctan.org>).
2. All of their symbols have L<sup>A</sup>T<sub>E</sub>X 2 <sub>$\varepsilon$</sub>  bindings. That is, a user should be able to access a symbol by name, not just by `\char<number>`.

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

## 1.1 Document Usage

Each section of this document contains a number of font tables. Each table shows a set of symbols, with the corresponding L<sup>A</sup>T<sub>E</sub>X command to the right of each symbol. A table's caption indicates what package needs to be loaded in order to access that table's symbols. For example, the symbols in Table 39 “textcomp Old-Style Numerals”, are made available by putting “`\usepackage{textcomp}`” in your document's preamble. “*AMS*” means to use the *AMS* packages, viz. `amssymb` and/or `amsmath`. Notes below a table provide additional information about some or all the symbols in that table.

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

Section 8 contains some additional information about the symbols in this document. It discusses how certain mathematical symbols can vary in height, shows which symbol names are not unique across packages, gives examples of how to create new symbols out of existing symbols, explains how symbols are spaced in math mode, compares various schemes for boldfacing symbols, presents L<sup>A</sup>T<sub>E</sub>X ASCII and Latin 1 tables, shows how to input and output Unicode characters, and provides some information about this document itself. The Comprehensive L<sup>A</sup>T<sub>E</sub>X 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.”	10	..	71
í, ï, ī, î, etc. (versus í, ï, ī, and î)	16	°, as in “180°” or “15°C”	74
¢	20	Ł, ₣, etc.	76
€	20	N, Z, R, etc.	76
©, ®, and ™	21	ż	76
%	22	f	116
ſſ	31	á, è, etc. (i.e., several accents per character)	118
⋮	34	<, >, and   (instead of i, i, and —)	124
:= and ::=	35	^ and ~ (or ∼)	125
≤ and ≥	43		

## 2 Body-text symbols

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

TABLE 1: L<sup>A</sup>T<sub>E</sub>X 2 <sub>$\varepsilon$</sub>  Escapable “Special” Characters

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

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

TABLE 2: Predefined L<sup>A</sup>T<sub>E</sub>X 2 <sub>$\varepsilon$</sub>  Text-mode Commands

^	\textasciicircum*	<	\textless
~	\textasciitilde*	a	\textordfeminine
*	\textasteriskcentered	o	\textordmasculine
\	\textbackslash	\P	\textparagraph <sup>†</sup>
	\textbar	.	\textperiodcentered
{	\textbraceleft <sup>†</sup>	\textquestondown	
}	\textbraceright <sup>†</sup>	\textquotedblleft	
•	\textbullet	\textquotedblright	
©	\textcopyright <sup>†</sup>	\textquotelleft	
†	\textdagger <sup>†</sup>	\textquoteright	
‡	\textdaggerdbl <sup>†</sup>	\textregistered	
\$	\textdollar <sup>†</sup>	\textsection <sup>†</sup>	
...	\textellipsis <sup>†</sup>	\textsterling <sup>†</sup>	
—	\textemdash	\texttrademark	
–	\textendash	\textunderscore <sup>†</sup>	
¡	\textexclamdown	\textvisiblespace	
>	\textgreater		

Where two symbols are present, the left one is the “faked” symbol that L<sup>A</sup>T<sub>E</sub>X 2 <sub>$\varepsilon$</sub>  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 125.

<sup>†</sup> It’s generally preferable to use the corresponding symbol from Table 3 because the symbols in that table work properly in both text mode and math mode.

TABLE 3: L<sup>A</sup>T<sub>E</sub>X 2 <sub>$\varepsilon$</sub>  Commands Defined to Work in Both Math and Text Mode

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

Where two symbols are present, the left one is the “faked” symbol that L<sup>A</sup>T<sub>E</sub>X 2 <sub>$\varepsilon$</sub>  provides by default, and the right one is the “true” symbol that `textcomp` makes available.

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

✓ \checkmark ® \circledR ✕ \maltese

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

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

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

TABLE 6: Letters Used to Typeset African Languages

đ	\B{D}	đ	\m{c}	f	\m{f}	k	\m{k}	t	\M{t}	ż	\m{Z}
đ	\B{d}	đ	\m{D}	F	\m{F}	Đ	\m{N}	T	\M{T}	Ξ	\T{E}
H	\B{H}	d	\M{d}	Y	\m{G}	ŋ	\m{n}	f	\m{t}	ɛ	\T{e}
h	\B{h}	D	\M{D}	ȝ	\m{g}	ɔ	\m{o}	T	\m{T}	Ӧ	\T{O}
t	\B{t}	d'	\m{d}	ł	\m{I}	ɔ	\m{O}	v	\m{u}*	ɔ	\T{o}
T	\B{T}	E	\m{E}	ı	\m{i}	P	\m{P}	U	\m{U}*		
ň	\m{b}	ɛ	\m{e}	N	\m{J}	ɸ	\m{p}	Y	\m{Y}		
B	\m{B}	Ǝ	\M{E}	n	\m{j}	ʃ	\m{s}	y	\m{y}		
C	\m{C}	ə	\M{e}	K	\m{K}	ʃ	\m{S}	z	\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 ḡ \ohorn Ӄ \UHORN Ӄ \uhorn

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

TABLE 8: Punctuation Marks Not Found in OT1

```
< \guillemotleft < \guilsinglleft „ \quotedblbase " \textquotedbl
» \guillemotright > \guilsinglright , \quotesinglbase
```

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

TABLE 9: pifont Decorative Punctuation Marks

```
• \ding{123} “ \ding{125} ¶ \ding{161} • \ding{163}
• \ding{124} ” \ding{126} : \ding{162}
```

TABLE 10: tipa Phonetic Symbols

γ	\textbabygamma	?	\textglotstop	η	\textrtailn
β	\textbarb	‘	\texthalflength	τ	\textrtailr
ε	\textbarc	’	\texthardsign	ς	\textrtails
đ	\textbard	‘	\texthooktop	ť	\textrtailt
᷂	\textbardotlessj	᷃	\texthtb	᷄	\textrtailz
᷅	\textbarg	᷆	\texthtbardotlessj	᷇	\textrthook
᷈	\textbarglotstop	᷉	\texthtc	᷉	\textsca
᷊	\textbari	᷋	\texthtd	᷌	\textscb
᷌	\textbarl	᷍	\texthtg	᷎	\textscce
᷏	\textbaro	᷎	\texthtth	᷏	\textscg
᷐	\textbarrevglotstop	᷏	\texthtcheng	᷐	\textsch
᷑	\textbaru	᷒	\texthtk	᷑	\textschwa
᷒	\textbeltl	ᷓ	\texthtp	᷒	\textsci
ᷔ	\textbeta	ᷔ	\texthtq	ᷔ	\textscj
ᷕ	\textbullseye	ᷔ	\texthtrtaild	ᷕ	\text scl
ᷖ	\textceltpal	ᷔ	\texthtscg	ᷖ	\textscn
ᷗ	\textchi	ᷔ	\texthtt	ᷗ	\textcoelig
ᷘ	\textclosepsilon	ᷔ	\texthvlig	ᷘ	\textcomega
ᷙ	\textcloseomega	ᷔ	\textinvglotstop	ᷙ	\textscr
ᷚ	\textcloserevepsilon	ᷔ	\textinvscr	ᷚ	\textscripta
ᷛ	\textcommatailz	ᷔ	\textiota	ᷛ	\textscriptg
ᷜ	\textcorner	ᷔ	\textlambda	ᷜ	\textscriptv
ᷝ	\textcrb	ᷔ	\textlengthmark	ᷝ	\textscu
ᷞ	\textcrd	ᷔ	\textlhookt	ᷞ	\textscy
ᷟ	\textcrg	ᷔ	\textlhlongi	ᷟ	\textsecstress
ᷟ	\textcrh	ᷔ	\textlhlongy	ᷟ	\textsoftsign
ᷟ	\textcrinvglotstop	ᷔ	\textlonglegr	ᷟ	\textstretchc
ᷟ	\textcrlambda	ᷔ	\textlptr	ᷟ	\texttctclig
ᷟ	\textcrtwo	ᷔ	\textltailm	ᷟ	\textteshlig
ᷟ	\textctc	ᷔ	\textltailn	ᷟ	\texttheta
ᷟ	\textctd	ᷔ	\textltilde	ᷟ	\textthorn
ᷟ	\textctdzlig	ᷔ	\textlyoghlig	ᷟ	\texttoneletterstem
ᷟ	\textctesh	ᷔ	\textObardotlessj	ᷟ	\texttslig
ᷟ	\textctj	ᷔ	\textOlyoghlig	ᷟ	\textturna
ᷟ	\textctn	ᷔ	\textomega	ᷟ	\textturncelig
ᷟ	\textctt	ᷔ	\textopencorner	ᷟ	\textturnh
ᷟ	\textcttctclig	ᷔ	\textopeno	ᷟ	\textturnk
ᷟ	\textctyogh	ᷔ	\textpalhook	ᷟ	\textturnlonglegr

(continued on next page)

(continued from previous page)

z	\textctz	Φ	\textphi	υ	\textturnm
đ	\textdctzlig		\textpipe	ϙ	\textturnmrleg
ƒ	\textdoublebaresh	'	\textprimstress	ϙ	\textturnnr
‡	\textdoublebarpipe	՞	\textraiseglotstop	ϙ	\textturnrrtail
≠	\textdoublebarslash	՞	\textraisevibyi	ϙ	\textturnscripta
	\textdoublepipe	՞	\textramshorns	ϙ	\textturnrt
	\textdoublevertline	՞	\textrevapostrophe	ϙ	\textturnv
↓	\textdownstep	՞	\textreve	ϙ	\textturnw
đ	\textdyoghlig	՞	\textrevepsilon	ϙ	\textturny
đ	\textdzlig	՞	\textrevglotstop	ϙ	\textupsilon
ε	\textepsilon	՞	\textrevyogh	ϙ	\textupstep
ſ	\textesh	՞	\textrhookrevepsilon	ϙ	\textvertline
ſ	\textfishhookr	՞	\textrhookschwa	ϙ	\textvibyi
g	\texttg	՞	\textrhicity	ϙ	\textvibyy
γ	\textgamma	՞	\textrptr	ϙ	\textwynn
›	\textglobfall	՞	\textrtaild	ϙ	\textyogh
↗	\textglobrise	՞	\textrtaill	ϙ	

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

ao	\textaolig	ſ	\texthtbar{dotless}{jvar}	ϲ	\textrthooklong
ȝ	\textbentailyogh	ω	\textinvomega	ԁ	\textsc{aolig}
γ	\textbktailgamma	ν	\textinvsca	Δ	\textsc{delta}
ڏ	\textctinvglotstop	σ	\textinvscripta	F	\textsc{cf}
ڇ	\textctjvar	ڱ	\textlfishhookrlig	K	\textsc{k}
ڏ	\textctstretchc	ڣ	\textlhookfour	M	\textsc{cm}
ڏ	\textctstretchcvr	ڦ	\textlhookp	P	\textsc{cp}
ڏ	\textctturnt	ڻ	\textlhti	Q	\textsc{cq}
ڏ	\textdblig	ڻ	\textlooptoprevesh	ڌ	\textsc{leftarrow}
‡	\textdoublebarpipevar	ڻ	\textnrleg	C	\textsc{stretchcvr}
	\textdoublepipevar	ଓ	\textObullseye	ڌ	\textsc{subdoublearrow}
↓	\textdownfullarrow	ڙ	\textpalhooklong	ڌ	\textsc{subrightarrow}
♀	\textfemale	ڙ	\textpalhookvar	ڦ	\textthornvari
n	\textfrbarn	ڻ	\textpipevar	ڦ	\textthornvari
ڏ	\textfrhookd	ڦ	\textqplig	ڦ	\textthornvariii
ڏ	\textfrhookdvar	ڦ	\textrectangle	ڦ	\textthornvariv
t	\textfrhookt	ڦ	\textretractingvar	ڦ	\textturnglotstop
γ	\textfrtailgamma	ڙ	\textrevscl	ڦ	\textturnscripta
?	\textglotstopvari	ڙ	\textrevscr	ڦ	\textturnscu

(continued on next page)

(continued from previous page)

?	\textglotstopvarii	a	\textrhooka	ξ	\textturnthree
?	\textglotstopvariii	e	\textrhooke	ζ	\textturntwo
γ	\textgrgamma	ε	\textrhookepsilon	ο	\textuncrfemale
ḥ	\textheng	ø	\textrhookopeno	↑	\textupfullarrow
hm	\texthmlig	ɦ	\textrtailhth		

TABLE 12: wsipa Phonetic Symbols

ȝ	\babygamma	ȝ	\eng	ȝ	\labdentalnas	ə	\schwa
þ	\barb	ð	\er	ɸ	\latfric	I	\sci
ð	\bard	ʃ	\esh	ʍ	\legm	N	\scn
ȝ	\bari	ð	\eth	ɹ	\legr	R	\scr
ɬ	\barl	r	\flapr	ʒ	\lz	ɑ	\scripta
θ	\baro	?	\glotstop	ɑ	\nialpha	g	\scriptg
ƿ	\barp	þ	\hookb	β	\nibeta	v	\scriptv
᷑	\barsci	ð	\hookd	χ	\nichi	U	\scu
ᚦ	\barscu	ȝ	\hookg	ɛ	\niepsilon	Y	\scy
ᚨ	\baru	ɦ	\hookh	ȝ	\nigamma	þ	\slashb
ᷔ	\clickb	ȝ	\hookheng	ι	\niota	ɛ	\slashc
ᷖ	\clickc	ȝ	\hookrevepsilon	λ	\nilambda	đ	\slashd
ᷗ	\clickt	hv		ω	\niomega	ꝝ	\slasu
ᷘ	\closedniomega	ɛ	\inva	ɸ	\niph	đ	\taild
ᷙ	\closedrevepsilon	j	\invf	σ	\nisigma	ł	\tailinvr
ᷚ	\crossb	ȝ	\invglotstop	θ	\nitheta	ł	\taill
ᷛ	\crossd	ɥ	\invh	ʊ	\niupsilon	ɳ	\tailn
ᷜ	\crossh	l	\invlegr	ɲ	\nj	ł	\tailr
ᷟ	\crossnilambda	w	\invm	œ	\oo	s	\tails
ᷠ	\curlyc	x	\invr	ɔ	\openo	t	\tailt
ᷡ	\curlyesh	ȝ	\invscr	ə	\reve	z	\tailz
ᷢ	\curlyyogh	v	\invscripta	ɸ	\reveject	ȝ	\tesh
ᷣ	\curlyz	ʌ	\invv	ʒ	\revepsilon	þ	\thorn
ᷤ	\dlbari	m	\invw	ɸ	\revglotstop	đ	\tildel
ᷥ	\dz	λ	\invy	D	\scd	ȝ	\yogh
ᷦ	\ejective	y	\ipagamma	G	\scg		

TABLE 13: wasysym Phonetic Symbols

D	\DH	ð	\dh	ɔ	\openo
D	\Thorn	ə	\inve	þ	\thorn

TABLE 14: phonetic Phonetic Symbols

$\text{J}$	<code>\barj</code>	$\text{f}$	<code>\flap</code>	$\dot{\text{i}}$	<code>\ibar</code>	$\text{v}$	<code>\rotvara</code>	$\text{t}$	<code>\vari</code>
$\text{X}$	<code>\barlambda</code>	$\text{?}$	<code>\glottal</code>	$\text{o}$	<code>\openo</code>	$\text{m}$	<code>\rotw</code>	$\text{o}$	<code>\varomega</code>
$\text{nj}$	<code>\emgma</code>	$\text{B}$	<code>\hausaB</code>	$\text{h}$	<code>\planck</code>	$\text{x}$	<code>\roty</code>	$\text{o}$	<code>\varopeno</code>
$\text{ny}$	<code>\engma</code>	$\text{b}$	<code>\hausab</code>	$\text{a}$	<code>\pwedge</code>	$\text{e}$	<code>\schwa</code>	$\text{v}$	<code>\vod</code>
$\text{pn}$	<code>\enya</code>	$\text{d}$	<code>\hausad</code>	$\text{D}$	<code>\revD</code>	$\text{p}$	<code>\thorn</code>	$\text{fi}$	<code>\voicedh</code>
$\text{z}$	<code>\epsi</code>	$\text{D}$	<code>\hausaD</code>	$\text{i}$	<code>\riota</code>	$\text{u}$	<code>\ubar</code>	$\text{z}$	<code>\yogh</code>
$\text{ʃ}$	<code>\esh</code>	$\text{k}$	<code>\hausak</code>	$\text{u}$	<code>\rotm</code>	$\text{q}$	<code>\udesc</code>		
$\text{ð}$	<code>\eth</code>	$\text{K}$	<code>\hausaK</code>	$\text{v}$	<code>\rotOmega</code>	$\text{a}$	<code>\vara</code>		
$\text{fj}$	<code>\fj</code>	$\text{d}$	<code>\hookd</code>	$\text{x}$	<code>\rotr</code>	$\text{g}$	<code>\varg</code>		

TABLE 15: t4phonet Phonetic Symbols

$\text{đ}$	<code>\textcrd</code>	$\text{đ}$	<code>\texthtd</code>	$\text{ }$	<code>\texttpipe</code>
$\text{ḥ}$	<code>\textcrh</code>	$\text{k}$	<code>\texthtk</code>	$\text{đ}$	<code>\textrtaild</code>
$\text{ɛ}$	<code>\textepsilon</code>	$\text{ɸ}$	<code>\texthtp</code>	$\text{t}$	<code>\textrtailt</code>
$\text{ʃ}$	<code>\textesh</code>	$\text{f}$	<code>\texthtt</code>	$\text{đ}$	<code>\textschwa</code>
$\text{fj}$	<code>\textfjlig</code>	$\text{u}$	<code>\texttiota</code>	$\text{ſ}$	<code>\textscriptv</code>
$\text{b}$	<code>\texthtb</code>	$\text{jn}$	<code>\textltailn</code>	$\text{ť}$	<code>\textteshlig</code>
$\text{č}$	<code>\texthtc</code>	$\text{o}$	<code>\textopeno</code>	$\text{ž}$	<code>\textyogh</code>

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 11) but using the same names as the `tipa` characters presented in Table 10 on page 12.

TABLE 16: semtrans Transliteration Symbols

$\text{›}$  `\Alif`       $\text{‹}$  `\Ayn`

TABLE 17: Text-mode Accents

$\ddot{A}a$	<code>\"{"A}"\"{"a}</code>	$\grave{A}a$	<code>\`{"A}"\`{"a}</code>	$\dot{A}a$	<code>\d{"A}"\d{"a}</code>	$\ddot{A}a$	<code>\r{"A}"\r{"a}</code>
$\acute{A}a$	<code>\'{A}"\'{"a}</code>	$\acute{A}a$	<code>\ {"A}"\ {"a}</code> <sup>†</sup>	$\ddot{A}a$	<code>\G{"A}"\G{"a}</code> <sup>‡</sup>	$\grave{A}a$	<code>\t{"A}"\t{"a}</code>
$\grave{A}a$	<code>\.{A}"\.{a}</code>	$\tilde{A}a$	<code>\~{"A}"\~{"a}</code>	$\dot{A}a$	<code>\h{"A}"\h{"a}</code> <sup>§</sup>	$\acute{A}a$	<code>\u{"A}"\u{"a}</code>
$\bar{A}a$	<code>\={A}"\={a}</code>	$\bar{A}a$	<code>\b{"A}"\b{"a}</code>	$\ddot{A}a$	<code>\H{"A}"\H{"a}</code>	$\acute{\bar{A}}a$	<code>\U{"A}"\U{"a}</code> <sup>‡</sup>
$\hat{A}a$	<code>\^{"A}"\^{"a}</code>	$\hat{A}a$	<code>\c{"A}"\c{"a}</code>	$\grave{\bar{A}}a$	<code>\k{"A}"\k{"a}</code> <sup>†</sup>	$\acute{\bar{A}}a$	<code>\v{"A}"\v{"a}</code>
		$\hat{\bar{A}}a$	<code>\newtie{"A}"\newtie{"a}"*</code>			$\grave{\hat{A}}a$	<code>\textcircled{"A}"\textcircled{"a}</code>

\* Requires the `textcomp` package.

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

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

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

Also note the existence of `\i` and `\j`, which produce dotless versions of “i” and “j” (viz., “i” and “j”). These are useful when the accent is supposed to replace the dot in encodings that need to composite (i.e., combine) letters and accents. For example, “na\"{\i}ve” always produces a correct “naïve”, while “na\"{\i}ve” yields the rather odd-looking “naïve” when using the OT1 font encoding and older versions of L<sup>A</sup>T<sub>E</sub>X. Font encodings other than OT1 and newer versions of L<sup>A</sup>T<sub>E</sub>X properly typeset “na\"{\i}ve” as “naïve”.

TABLE 18: `tipa` Text-mode Accents

$\acute{A}a$	<code>\textacutemacron{"A}"\textacutemacron{"a}</code>
$\acute{\grave{A}}a$	<code>\textacuteewedge{"A}"\textacuteewedge{"a}</code>
$\grave{A}\grave{a}$	<code>\textadvancing{"A}"\textadvancing{"a}</code>
$\grave{A}a$	<code>\textbottomtiebar{"A}"\textbottomtiebar{"a}</code>
$\breve{A}a$	<code>\textbrevemacron{"A}"\textbrevemacron{"a}</code>
$\grave{\tilde{A}}a$	<code>\textcircumacute{"A}"\textcircumacute{"a}</code>
$\grave{\hat{A}}a$	<code>\textcircumdot{"A}"\textcircumdot{"a}</code>
$\acute{\grave{A}}a$	<code>\textdotacute{"A}"\textdotacute{"a}</code>
$\grave{\acute{A}}a$	<code>\textdotbreve{"A}"\textdotbreve{"a}</code>
$\grave{\grave{A}}a$	<code>\textdoublegrave{"A}"\textdoublegrave{"a}</code>
$\grave{\grave{\grave{A}}a}$	<code>\textdoublebaraccent{"A}"\textdoublebaraccent{"a}</code>
$\grave{\grave{\grave{A}}a}$	<code>\textgravecircum{"A}"\textgravecircum{"a}</code>
$\grave{\grave{\grave{\grave{A}}a}}$	<code>\textgravedot{"A}"\textgravedot{"a}</code>
$\grave{\grave{\grave{\grave{\grave{A}}a}}}$	<code>\textgravemacron{"A}"\textgravemacron{"a}</code>

(continued on next page)

(continued from previous page)

Àà	\textgrave{A}\textgrave{a}
Àg	\textinvsubbridge{A}\textinvsubbridge{a}
Àä	\textlowering{A}\textlowering{a}
Áá	\textmidacute{A}\textmidacute{a}
Ãá	\textovercross{A}\textovercross{a}
Ãá	\textoverw{A}\textoverw{a}
Àg	\textpolhook{A}\textpolhook{a}
Àa	\textraising{A}\textraising{a}
Àá	\textretracting{A}\textretracting{a}
Àâ	\textringmacron{A}\textringmacron{a}
Ââ	\textroundcap{A}\textroundcap{a}
Àá	\textseagull{A}\textseagull{a}
Àá	\textsubacute{A}\textsubacute{a}
Àa	\textsubarch{A}\textsubarch{a}
Àa	\textsubbar{A}\textsubbar{a}
Àa	\textsubbridge{A}\textsubbridge{a}
Àá	\textsubcircum{A}\textsubcircum{a}
Àá	\textsubdot{A}\textsubdot{a}
Àá	\textsubgrave{A}\textsubgrave{a}
Àá	\textsublhalfing{A}\textsublhalfing{a}
Àá	\textsubplus{A}\textsubplus{a}
Àá	\textsubrhalfing{A}\textsubrhalfing{a}
Àá	\textsubring{A}\textsubring{a}
Àá	\textsubsquare{A}\textsubsquare{a}
Àá	\textsubtilde{A}\textsubtilde{a}
Àá	\textsubumlaut{A}\textsubumlaut{a}
Àá	\textsubw{A}\textsubw{a}
Àá	\textsubwedge{A}\textsubwedge{a}
Àá	\textsuperimpostilde{A}\textsuperimpostilde{a}
Àá	\textsyllabic{A}\textsyllabic{a}
Ãá	\texttildedot{A}\texttildedot{a}
Ãá	\texttoptiebar{A}\texttoptiebar{a}
Àá	\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

$\hat{A}\hat{a}$	<code>\bibridge{A}\bibridge{a}</code>	$\overset{\circ}{A}\overset{\circ}{a}$	<code>\partvoiceless{A}\partvoiceless{a}</code>
$\check{A}\check{a}$	<code>\crttilde{A}\crttilde{a}</code>	$\overset{\rightarrow}{A}\overset{\rightarrow}{a}$	<code>\sliding{A}\sliding{a}</code>
$\ddot{A}\ddot{a}$	<code>\dottedtilde{A}\dottedtilde{a}</code>	$\overset{\leftrightarrow}{A}\overset{\leftrightarrow}{a}$	<code>\spreadlips{A}\spreadlips{a}</code>
$\tilde{A}\tilde{a}$	<code>\doubletilde{A}\doubletilde{a}</code>	$\overset{\triangle}{A}\overset{\triangle}{a}$	<code>\subcorner{A}\subcorner{a}</code>
$\ddot{\check{A}}\ddot{\check{a}}$	<code>\finpartvoice{A}\finpartvoice{a}</code>	$\overset{=}{A}\overset{=}{a}$	<code>\subdoublebar{A}\subdoublebar{a}</code>
$\check{\ddot{A}}\check{\ddot{a}}$	<code>\finpartvoiceless{A}\finpartvoiceless{a}</code>	$\overset{  }{A}\overset{  }{a}$	<code>\subdoublevert{A}\subdoublevert{a}</code>
$\check{A}\check{a}$	<code>\inipartvoice{A}\inipartvoice{a}</code>	$\overset{\wedge}{A}\overset{\wedge}{a}$	<code>\sublptr{A}\sublptr{a}</code>
$\check{\check{A}}\check{\check{a}}$	<code>\inipartvoiceless{A}\inipartvoiceless{a}</code>	$\overset{\wedge\wedge}{A}\overset{\wedge\wedge}{a}$	<code>\subrptr{A}\subrptr{a}</code>
$\overset{\circ}{A}\overset{\circ}{a}$	<code>\overbridge{A}\overbridge{a}</code>	$\overset{\circ}{A}\overset{\circ}{a}$	<code>\whistle{A}\whistle{a}</code>
$\overset{\circ}{A}\overset{\circ}{a}$	<code>\partvoice{A}\partvoice{a}</code>		

TABLE 20: wsipa Text-mode Accents

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

TABLE 21: phonetic Text-mode Accents

$\overset{\circ}{A}\overset{\circ}{a}$	<code>\hill{A}\hill{a}</code>	$\overset{\circ}{A}\overset{\circ}{a}$	<code>\rc{A}\rc{a}</code>	$\overset{\circ}{A}\overset{\circ}{a}$	<code>\ut{A}\ut{a}</code>
$\overset{\circ}{A}\overset{\circ}{a}$	<code>\od{A}\od{a}</code>	$\overset{\circ}{A}\overset{\circ}{a}$	<code>\syl{A}\syl{a}</code>		
$\overset{\circ}{A}\overset{\circ}{a}$	<code>\ohill{A}\ohill{a}</code>	$\overset{\circ}{A}\overset{\circ}{a}$	<code>\td{A}\td{a}</code>		

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

TABLE 22: metre Text-mode Accents

$\acute{A}\acute{a}$	<code>\acutus{A}\acutus{a}</code>
$\breve{A}\breve{a}$	<code>\breve{A}\breve{a}</code>
$\tilde{A}\tilde{a}$	<code>\circumflexus{A}\circumflexus{a}</code>
$\ddot{A}\ddot{a}$	<code>\diaeresis{A}\diaeresis{a}</code>
$\grave{A}\grave{a}$	<code>\gravis{A}\gravis{a}</code>
$\bar{A}\bar{a}$	<code>\macron{A}\macron{a}</code>

TABLE 23: `t4phonet` Text-mode Accents

$\widehat{A}\ddot{a}$	<code>\textdoublegrave{A}\textdoublegrave{a}</code>
$\widehat{A}\acute{a}$	<code>\textvbaraccent{A}\textvbaraccent{a}</code>
$\widehat{A}\ddot{\acute{a}}$	<code>\textdoublevbaraccent{A}\textdoublevbaraccent{a}</code>

The idea behind the `t4phonet` package's text-mode accents is to provide an interface to some of the accents in the T4 font encoding (accents marked with “‡” in Table 17 on page 16) but using the same names as the `tipa` accents presented in Table 18 on page 16.

TABLE 24: `arcs` Text-mode Accents

$\widehat{A}\bar{a}$	<code>\overarc{A}\overarc{a}</code>	$\widehat{a}$	<code>\underarc{A}\underarc{a}</code>
----------------------	-------------------------------------	---------------	---------------------------------------

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

TABLE 25: `semtrans` Accents

$\dot{A}\dot{a}$	<code>\D{A}\D{a}</code>	$\ddot{A}\ddot{a}$	<code>\U{A}\U{a}</code>
$\dot{V}\dot{e}$	<code>\T{A}\T{a}^*</code>		

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

TABLE 26: `ogonek` Accents

$\dot{A}\dot{a}$	<code>\k{A}\k{a}</code>
------------------	-------------------------

TABLE 27: `combelow` Accents

$\dot{A}\dot{a}$	<code>\cb{A}\cb{a}</code>
------------------	---------------------------

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

TABLE 28: *wsuipa* Diacritics

`	\ain	<	\lefttp	°	\overring	'	\stress	_	\underwedge
˘	\corner	¬	\lefttt	˘	\polishhook	,	\syllabic	^	\upp
ˇ	\downp	፣	\length	˃	\rightp	..	\underdots	±	\upt
ᜂ	\downt	~	\midtilde	Ւ	\rightt	。	\underring		
ᜄ	\halflength	ᜁ	\open	,	\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 “ä”. See the *wsuipa* documentation for more information.

TABLE 29: *textcomp* Diacritics

”	\textacutedbl	ˇ	\textasciicaron	ˉ	\textasciimacron
‘	\textasciiaacute	“	\textasciidieresis	”	\textgravedbl
ᜁ	\textasciibreve	ᜁ	\textasciigrave		

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

TABLE 30: *textcomp* Currency Symbols

฿	\textbaht	\$	\textdollar*	G	\textguarani	₩	\textwon
₵	\textcent	\$	\textdollaroldstyle	£	\textlira	¥	\textyen
₵	\textcentoldstyle	đ	\textdong	₦	\textnaira		
₡	\textcolonmonetary	€	\texteuro	P	\textpeso		
₪	\textcurrency	f	\textflorin	£	\textsterling*		

\* It's generally preferable to use the corresponding symbol from Table 3 on page 10 because the symbols in that table work properly in both text mode and math mode.

TABLE 31: *marvosym* Currency Symbols

฿	\Denarius	€	\EUR	€	\EURdig	€	\EURtm	฿	\Pfund
₫	\Ecommerce	€	\EURcr	€	\EURhv	\$	\EyesDollar	β	\Shilling

The different euro signs are meant to be visually compatible with different fonts—Courier (`\EURcr`), Helvetica (`\EURhv`), Times Roman (`\EURtm`), and the *marvosym* digits listed in Table 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: *GoIA2e* Currency Symbols

$\text{\texteuro}$  \Euro  $\text{\textpound}$  \Pound

TABLE 34: teubner Currency Symbols

$\text{\texttimes}$	\denarius	$\text{\textcircled{c}}$	\hemiobelion	$\text{\textcircled{o}}$	\tetartemorion
$\text{\textleftarrow}$	\dracma	$\text{\textcircled{s}}$	\stater		

TABLE 35: *eurosym* Euro Signs

$\text{\texteuro}$  \geneuro  $\text{\texteuro}$  \geneuronarrow  $\text{\texteuro}$  \geneurowide  $\text{\texteuro}$  \officialeuro

$\text{\texteuro}$  is automatically mapped to one of the above—by default,  $\text{\officialeuro}$ —based on a *eurosym* package option. See the *eurosym* documentation for more information. The  $\text{\geneuro...}$  characters are generated from the current body font’s “C” character and therefore may not appear exactly as shown.

TABLE 36: *fourier* Euro Signs

$\text{\texteuro}$  \eurologo  $\text{\texteuro}$  \texteuro

TABLE 37: *textcomp* Legal Symbols

$\text{\textcircled{P}}$	\textcircled{P}	$\text{\textcircled{C}}$	\textcircled{C}	\textcopyright	$\text{\textcircled{SM}}$	\textcircled{SM}	\textservicemark
$\text{\textcircled{(R)}}$	\textcircled{(R)}	$\text{\textcircled{R}}$	\textcircled{R}	\textregistered	$\text{\textcircled{TM}}$	\textcircled{TM}	\texttrademark

Where two symbols are present, the left one is the “faked” symbol that *LATEX 2<sub>E</sub>* 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 “ $\text{\textcircled{R}}$ ” when you expected to get a “ $\text{\textcircled{(R)}}$ ”).

TABLE 38: *cclICENSES* Creative Commons License Icons

$\text{\textcircled{cc}}$	\cc	$\text{\textcircled{BY}}$	\ccby	$\text{\textcircled{NC}}$	\ccnc*	$\text{\textcircled{ND}}$	\ccnd	$\text{\textcircled{(R)}}$	\ccsa*
---------------------------	-----	---------------------------	-------	---------------------------	--------	---------------------------	-------	----------------------------	--------

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

TABLE 39: `textcomp` Old-style Numerals

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

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

TABLE 40: Miscellaneous `textcomp` Symbols

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

Where two symbols are present, the left one is the “faked” symbol that L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> 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 10 because the symbols in that table work properly in both text mode and math mode.

TABLE 41: Miscellaneous `wasysym` Text-mode Symbols

%oo    \permil

### 3 Mathematical symbols

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

Alphanumeric symbols (e.g., “ $\mathcal{L}$ ” and “ $\mathbb{Z}$ ”) are usually produced using one of the math alphabets in Table 213 rather than with an explicit symbol command. Look there first if you need a symbol for a transform, number set, or some other alphanumeric.

Although there have been many requests on `comp.text.tex` for a contradiction symbol, the ensuing discussion invariably reveals innumerable ways to represent contradiction in a proof, including “ $\dashv$ ” (`\blitza`), “ $\Rightarrow\Leftarrow$ ” (`\Rightarrow\Leftarrow`), “ $\perp$ ” (`\bot`), “ $\leftrightarrow$ ” (`\nleftrightarrow`), and “ $\divideontimes$ ” (`\textreferencemark`). Because of the lack of notational consensus, it is probably better to spell out “Contradiction!” than to use a symbol for this purpose. Similarly, discussions on `comp.text.tex` have revealed that there are a variety of ways to indicate the mathematical notion of “is defined as”. Common candidates include “ $\triangleq$ ” (`\triangleq`), “ $\equiv$ ” (`\equiv`), “ $\coloneqq$ ” (*various*<sup>1</sup>), and “ $\stackrel{\text{def}}{=}$ ” (`\stackrel{\text{def}}{=}`). See also the example of `\equalsfill` on page 118. Depending upon the context, disjoint union may be represented as “ $\coprod$ ” (`\coprod`), “ $\sqcup$ ” (`\sqcup`), “ $\dotcup$ ” (`\dotcup`), “ $\oplus$ ” (`\oplus`), or any of a number of other symbols.<sup>2</sup> 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 “ $\mathcal{O}x$ ” or “ $\mathcal{D}x$ ” (`\diameter x` or `\varnothing x`). The moral of the story is that you should be careful always to explain your notation to avoid confusing your readers.

TABLE 42: Math-Mode Versions of Text Symbols

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

It’s generally preferable to use the corresponding symbol from Table 3 on page 10 because the symbols in that table work properly in both text mode and math mode.

TABLE 43: `cml` Unary Operators

<code>!</code>	<code>\oc*</code>	<code>\shneg</code>	<code>?</code>	<code>\wn*</code>
<code>\shshift</code>	<code>\shdown</code>	<code>\shpos</code>		

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

<sup>1</sup>In `txfonts`, `pxfonts`, and `mathtools` the symbol is called `\coloneqq`. In `mathabx` and `MnSymbol` it’s called `\coloneq`. In `colonequals` it’s called `\colonequals`.

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

TABLE 44: Binary Operators

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

\* Not predefined in L<sup>A</sup>T<sub>E</sub>X 2<sub>&</sub>. Use one of the packages `latexsym`, `amsfonts`, `amssymb`, `txfonts`, `pxfonts`, or `wasysym`.

TABLE 45: *AMS* Binary Operators

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

\* Some people use a superscripted \intercal for matrix transpose: “A<sup>\intercal</sup>”  $\mapsto$  “A<sup>T</sup>”. (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 59), T, and \mathsf{T} are other popular choices: “A<sup>T</sup>”, “A<sup>T</sup>”, “A<sup>T</sup>”.

TABLE 46: *stmaryrd* Binary Operators

$\phi$	<code>\baro</code>	$\parallel$	<code>\interleave</code>	$\circledast$	<code>\varoast</code>
$\backslash\!\backslash$	<code>\bbslash</code>	$\lhd$	<code>\leftslice</code>	$\circledcirc$	<code>\varobar</code>
$\&$	<code>\binampersand</code>	$\amalg$	<code>\merge</code>	$\circledcircledcirc$	<code>\varobslash</code>
$\wp$	<code>\bindnasrepma</code>	$\ominus$	<code>\minuso</code>	$\circledcircledcircledcirc$	<code>\varocircle</code>
$\blacksquare$	<code>\boxast</code>	$\pm$	<code>\moo</code>	$\odot$	<code>\varodot</code>
$\blacksquare$	<code>\boxbar</code>	$\oplus$	<code>\nplus</code>	$\circledcircledcircledcircledcirc$	<code>\varogreaterthan</code>
$\blacksquare$	<code>\boxbox</code>	$\ominus$	<code>\obar</code>	$\circledcircledcircledcircledcircledcirc$	<code>\varolessthan</code>
$\blacksquare$	<code>\boxbslash</code>	$\square$	<code>\oblong</code>	$\ominus\ominus$	<code>\varominus</code>
$\blacksquare$	<code>\boxcircle</code>	$\oslash$	<code>\obslash</code>	$\oplus\oplus$	<code>\varoplus</code>
$\blacksquare$	<code>\boxdot</code>	$\oslash\oslash$	<code>\ogreaterthan</code>	$\oslash\oslash\oslash$	<code>\varoslash</code>
$\blacksquare$	<code>\boxempty</code>	$\oslash\oslash\oslash$	<code>\olessthan</code>	$\otimes\otimes$	<code>\varotimes</code>
$\blacksquare$	<code>\boxslash</code>	$\oslash\oslash\oslash\oslash$	<code>\ovee</code>	$\oslash\oslash\oslash\oslash\oslash$	<code>\varovee</code>
$\Downarrow$	<code>\curlyveedownarrow</code>	$\oslash\oslash\oslash\oslash\oslash\oslash$	<code>\owedge</code>	$\oslash\oslash\oslash\oslash\oslash\oslash\oslash$	<code>\varowedge</code>
$\Uparrow$	<code>\curlyveeuparrow</code>	$\triangleright$	<code>\rightslice</code>	$\times\times\times\times\times\times\times\times\times$	<code>\vartimes</code>
$\nwarrow$	<code>\curlywedgedownarrow</code>	$//$	<code>\sslash</code>	$\Upsilon$	<code>\Ydown</code>
$\nearrow$	<code>\curlywedgeuparrow</code>	$\parallel$	<code>\talloblong</code>	$\prec$	<code>\Yleft</code>
$\backslash\!\backslash$	<code>\fatbslash</code>	$\bigcirc$	<code>\varbigcirc</code>	$\succ$	<code>\Yright</code>
$\ddot{\cdot}$	<code>\fatsemi</code>	$\curlyvee$	<code>\varcurlyvee</code>	$\curlywedge$	<code>\Yup</code>
$\//$	<code>\fatslash</code>	$\curlywedge$	<code>\varcurlywedge</code>		

TABLE 47: *wasysym* Binary Operators

$\lhd$	<code>\lhd</code>	$\circ$	<code>\circlearrowleft</code>	$\blacktriangleright$	<code>\RHD</code>	$\trianglerighteq$	<code>\unrhd</code>
$\blacktriangleleft$	<code>\LHD</code>	$\triangleright$	<code>\rhd</code>	$\trianglelefteq$	<code>\unlhd</code>		

TABLE 48: *txfonts/pxfonts* Binary Operators

$\circledcirc$	<code>\circledbar</code>	$\circledcirc$	<code>\circledwedge</code>	$\circ$	<code>\medcirc</code>
$\circledcirc$	<code>\circledbslash</code>	$\wp$	<code>\invamp</code>	$\blacksquare$	<code>\sqcapplus</code>
$\circledcirc$	<code>\circledvee</code>	$\bullet$	<code>\medbullet</code>	$\blacksquare$	<code>\sqcupplus</code>

TABLE 49: mathabx Binary Operators

$*$	$\backslash$ ast	$\wedge$	$\backslash$ curlywedge	$\sqcap$	$\backslash$ sqcap
$\ast$	$\backslash$ Asterisk	$\div$	$\backslash$ divdot	$\sqcup$	$\backslash$ sqcup
$\pi$	$\backslash$ barwedge	$\divideontimes$	$\backslash$ divideontimes	$\sqcap\sqcap$	$\backslash$ sqdoublecap
$\star$	$\backslash$ bigstar	$\dot{\div}$	$\backslash$ dotdiv	$\sqcup\sqcup$	$\backslash$ sqdoublecup
$\bigstar$	$\backslash$ bigvarstar	$\dot{+}$	$\backslash$ dotplus	$\square$	$\backslash$ square
$\blacklozenge$	$\backslash$ blackdiamond	$\dot{\times}$	$\backslash$ dottimes	$\boxplus$	$\backslash$ squplus
$\cap$	$\backslash$ cap	$\bar{\wedge}$	$\backslash$ doublebarwedge	$\cdot$	$\backslash$ udot
$\circledplus$	$\backslash$ circplus	$\bar{\wedge}$	$\backslash$ doublecap	$\oplus$	$\backslash$ uplus
$\coasterisk$	$\backslash$ coasterisk	$\bar{\cup}$	$\backslash$ doublecup	$\star$	$\backslash$ varstar
$\coAsterisk$	$\backslash$ coAsterisk	$\ltimes$	$\backslash$ ltimes	$\vee$	$\backslash$ vee
$\convolution$	$\backslash$ convolution	$\oplus\circ$	$\backslash$ pluscirc	$\veebar$	$\backslash$ veebar
$\cup$	$\backslash$ cup	$\rtimes$	$\backslash$ rtimes	$\leqq$	$\backslash$ veedoublebar
$\vee$	$\backslash$ curlyvee	$\blacksquare$	$\backslash$ sqbullet	$\wedge$	$\backslash$ 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

$\sqcup$	$\backslash$ amalg	$\sqcup$	$\backslash$ doublesqcup	$\therefore$	$\backslash$ righttherefore
$*$	$\backslash$ ast	$\wedge$	$\backslash$ doublevee	$\times$	$\backslash$ rightthreetimes
$\times$	$\backslash$ backslashdiv	$\wedge$	$\backslash$ doublewedge	$\succ$	$\backslash$ rightY
$\bowtie$	$\backslash$ bowtie	$\therefore$	$\backslash$ downtherefore	$\rtimes$	$\backslash$ rtimes
$\bullet$	$\backslash$ bullet	$\succ$	$\backslash$ downY	$\times$	$\backslash$ slashdiv
$\cap$	$\backslash$ cap	$\times$	$\backslash$ dtimes	$\Pi$	$\backslash$ smallprod
$\sqcap$	$\backslash$ capdot	$\therefore$	$\backslash$ fivedots	$\sqcap$	$\backslash$ sqcap
$\sqcap$	$\backslash$ capplus	$\infty$	$\backslash$ hbipropto	$\sqcap\sqcap$	$\backslash$ sqcapdot
$\cdot$	$\backslash$ cdot	$\ldots$	$\backslash$ hddotdot	$\sqcap\sqcap$	$\backslash$ sqcapplus
$\circ$	$\backslash$ circ	$\sqcap$	$\backslash$ lefthalfcap	$\sqcup$	$\backslash$ sqcup
$\triangleright$	$\backslash$ closedcurlyvee	$\sqcap$	$\backslash$ lefthalfcup	$\sqcup$	$\backslash$ sqcupdot
$\triangleleft$	$\backslash$ closedcurlywedge	$\therefore$	$\backslash$ lefttherefore	$\sqcup$	$\backslash$ sqcupplus
$\cup$	$\backslash$ cup	$\times$	$\backslash$ leftthreetimes	$::$	$\backslash$ squaredots
$\sqcup$	$\backslash$ cupdot	$\prec$	$\backslash$ leftY	$\times$	$\backslash$ times
$\sqcup$	$\backslash$ cupplus	$\ltimes$	$\backslash$ ltimes	$\ldots$	$\backslash$ udotdot
$\triangleright$	$\backslash$ curlyvee	$\backslash$	$\backslash$ medbackslash	$\therefore$	$\backslash$ uptherefore
$\triangleright$	$\backslash$ curlyveedot	$\circ$	$\backslash$ medcircle	$\prec$	$\backslash$ upY
$\wedge$	$\backslash$ curlywedge	$\backslash$	$\backslash$ medslash	$\times$	$\backslash$ utimes
$\wedge$	$\backslash$ curlywedgedot	$\mid$	$\backslash$ medvert	$\mathfrak{g}$	$\backslash$ vbiopropto
$\cdot$	$\backslash$ ddotdot	$\vdash$	$\backslash$ medvertdot	$:$	$\backslash$ vdotdot
$\therefore$	$\backslash$ diamonddots	$-$	$\backslash$ minus	$\vee$	$\backslash$ vee

(continued on next page)

(continued from previous page)

$\div$	<code>\div</code>	$\div$	<code>\minusdot</code>	$\div$	<code>\veedot</code>
$\cdot\cdot$	<code>\dotmedvert</code>	$\mp$	<code>\mp</code>	$\bowtie$	<code>\vertbowtie</code>
$\cdot-$	<code>\dotminus</code>	$\wp$	<code>\neswbipropto</code>	$\cdot\cdot$	<code>\vertdiv</code>
$\Cap$	<code>\doublecap</code>	$\nwarrow$	<code>\nwsebipropto</code>	$\wedge$	<code>\wedge</code>
$\Cup$	<code>\doublecup</code>	$\oplus$	<code>\plus</code>	$\wedge$	<code>\wedgedot</code>
$\wr$	<code>\doublecurlyvee</code>	$\pm$	<code>\pm</code>	$\wr$	<code>\wreath</code>
$\wedge$	<code>\doublecurlywedge</code>	$\sqcap$	<code>\righthalfcap</code>		
$\sqcap$	<code>\doublesqcap</code>	$\sqcup$	<code>\righthalfcup</code>		

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

$\times$  `\dtimes`  $\times$  `\udtimes`  $\times$  `\utimes`

The **mathdesign** package additionally provides versions of each of the binary operators shown in Table 45 on page 24.

TABLE 52: **cml** Binary Operators

$\wp$  `\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

$\sqcup$  `\cshuffle`  $\sqcup$  `\shuffle`

TABLE 54: **ulsy** Geometric Binary Operators

$\oplus$  `\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	✳	\backslash	○	\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	▶	\filledtriangleleft	○	\overt
◊	\diamonddiamond	▲	\filledtriangleup	☆	\pentagram
◊	\diamonddot	◊	\meddiamond	◊	\smalldiamond
◊	\diamondminus	□	\medsquare	□	\smallsquare
◊	\diamondplus	☆	\medstar	☆	\smallstar
◊	\diamondslash	▽	\medtriangledown	▽	\smalltriangledown
◊	\diamondtimes	◀	\medtriangleleft	◀	\smalltriangleleft
◊	\diamondvert	▶	\medtriangleleft	▶	\smalltriangleright
▽	\downslice	△	\medtriangleup	△	\smalltriangleup
◆	\filleddiamond	⊗	\oast	*	\thinstar
■	\filledmedsquare	○	\backslash	△	\upslice

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

TABLE 57: Variable-sized Math Operators

$\cap \cap$	<code>\bigcap</code>	$\otimes \otimes$	<code>\bigotimes</code>	$\wedge \wedge$	<code>\bigwedge</code>	$\prod \prod$	<code>\prod</code>
$\cup \cup$	<code>\bigcup</code>	$\sqcup \sqcup$	<code>\bigsqcup</code>	$\coprod \coprod$	<code>\coprod</code>	$\sum \sum$	<code>\sum</code>
$\odot \odot$	<code>\bigodot</code>	$\uplus \uplus$	<code>\biguplus</code>	$\int \int$	<code>\int</code>		
$\oplus \oplus$	<code>\bigoplus</code>	$\vee \vee$	<code>\bigvee</code>	$\oint \oint$	<code>\oint</code>		

 TABLE 58: *AMS* Variable-sized Math Operators

$\iint$	$\iint$	<code>\iint</code>	$\iiint$	$\iiint$	<code>\iiint</code>
$\iiint$	$\iiint$	<code>\iiint</code>	$\dots \int \int \dots \int$	$\dots \int \int \dots \int$	<code>\idotsint</code>

 TABLE 59: *stmaryrd* Variable-sized Math Operators

$\square \square$	<code>\bigbox</code>	$\parallel \parallel$	<code>\biginterleave</code>	$\square \square$	<code>\bigsqcap</code>
$\curlyvee \curlyvee$	<code>\bigcurlyvee</code>	$\oplus \oplus$	<code>\bignplus</code>	$\nabla \nabla$	<code>\bigtriangledown</code>
$\curlywedge \curlywedge$	<code>\bigcurlywedge</code>	$\parallel \parallel$	<code>\bigparallel</code>	$\Delta \Delta$	<code>\bigtriangleup</code>

 TABLE 60: *wasysym* Variable-sized Math Operators

$\int \int$	<code>\int \int</code>	$\iint \iint$	<code>\iint \iint</code>	$\iiint \iiint$	<code>\iiint \iiint</code>
$\int \int$	<code>\varint</code>	$\oint \oint$	<code>\varoint</code>	$\oint \oint$	<code>\oint \oint</code>

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

\* Not defined when *wasysym* is passed the *integrals* option.

† Defined only when *wasysym* is passed the *integrals* option. Otherwise, the default L<sup>A</sup>T<sub>E</sub>X *\int* glyph (as shown in Table 57) is used.

TABLE 61: `mathabx` Variable-sized Math Operators

$\curlyvee$	$\bigboxslash$	$\bigoplus$
$\sqcap$	$\bigboxtimes$	$\bigoslash$
$\curlywedge$	$\bigboxtop$	$\bigotimes$
$\boxast$	$\bigboxtriangleup$	$\bigtriangleup$
$\boxbackslash$	$\bigboxvoid$	$\bigcirc$
$\boxbot$	$\bigcomplement$	$\bigplus$
$\boxcirc$	$\bigoasterisk$	$\biguplus$
$\boxcoasterisk$	$\bigbackslash$	$\bigtimes$
$\boxdiv$	$\bigbot$	$\iiint$
$\boxdot$	$\bigcirc$	$\iint$
$\boxleft$	$\bigcoasterisk$	$\int$
$\boxminus$	$\bigodiv$	$\oiint$
$\boxplus$	$\bigoleft$	$\oint$
$\boxright$	$\bigominus$	

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

$\sqcap$	$\sqcup$	<code>\bigsqcapplus</code>	$\oint$	$\ointclockwise$
$\sqcup$	$\sqcap$	<code>\bigsqcupplus</code>	$\oint$	$\ointctr-clockwise$
$f$	$f$	<code>\fint</code>	$\iiint$	$\sqiiint$
$\int \cdots \int$	$\int \cdots \int$	<code>\idotsint</code>	$\iiint$	$\sqiint$
$\iiint$	$\iiint$	<code>\iiiint</code>	$\oint$	$\sqoint$
$\iiint$	$\iiint$	<code>\iiint</code>	$\iiint$	$\varoiintclockwise$
$\iiint$	$\iiint$	<code>\iint</code>	$\iiint$	$\varoiintctr-clockwise$
$\oint$	$\oint$	<code>\oiintclockwise</code>	$\oint$	$\varoiintclockwise$
$\oint$	$\oint$	<code>\oiintctr-clockwise</code>	$\oint$	$\varoiintctr-clockwise$
$\oint$	$\oint$	<code>\oiint</code>	$\oint$	$\varointclockwise$
$\oint$	$\oint$	<code>\ointclockwise</code>	$\oint$	$\varointctr-clockwise$
$\oint$	$\oint$	<code>\ointctr-clockwise</code>	$\times$	$\varprod$
$\oint$	$\oint$	<code>\oint</code>		

TABLE 63: esint Variable-sized Math Operators

$\int \dots \int$	$\dots \int$	$\backslash dotsint$	$\oint$	$\oint$	$\backslash ointclockwise$
$f$	$f$	$\backslash fint$	$\oint$	$\oint$	$\backslash ointctrcclockwise$
$\iiint$	$\iiiiint$	$\backslash iiiint$	$\iiint$	$\iiiiint$	$\backslash sqiint$
$\iiint$	$\iiiiint$	$\backslash iiint$	$\oint$	$\oint$	$\backslash sqint$
$\iint$	$\iiint$	$\backslash iint$	$\iiint$	$\iiiiint$	$\backslash varoiint$
$\oint$	$\oint$	$\backslash landdownint$	$\oint$	$\oint$	$\backslash varointclockwise$
$\oint$	$\oint$	$\backslash landupint$	$\oint$	$\oint$	$\backslash varointctrcclockwise$
$\oint$	$\oint$	$\backslash oint$			

TABLE 64: MnSymbol Variable-sized Math Operators

$\cap$	$\cap$	$\backslash bigcap$	$\ominus$	$\ominus$	$\backslash bigominus$	$\complement$	$\complement$	$\backslash complement$
$\capdot$	$\capdot$	$\backslash bigcapdot$	$\oplus$	$\oplus$	$\backslash bigoplus$	$\coprod$	$\coprod$	$\backslash coprod$
$\capplus$	$\capplus$	$\backslash bigcapplus$	$\oslash$	$\oslash$	$\backslash bigoslash$	$\int \dots \int$	$\dots \int$	$\backslash idotsint$
$\circ$	$\circ$	$\backslash bigcircle$	$\otimes$	$\otimes$	$\backslash bigostar$	$\iiiiint$	$\iiiiint$	$\backslash iiiint$
$\cup$	$\cup$	$\backslash bigcup$	$\otimes$	$\otimes$	$\backslash bigotimes$	$\iiiiint$	$\iiiiint$	$\backslash iiint$
$\cupdot$	$\cupdot$	$\backslash bigcupdot$	$\triangleleft$	$\triangleleft$	$\backslash bigotriangle$	$\iiint$	$\iiint$	$\backslash iint$
$\cupplus$	$\cupplus$	$\backslash bigcupplus^*$	$\circledcirc$	$\circledcirc$	$\backslash bigovert$	$\int$	$\int$	$\backslash int$
$\curlyvee$	$\curlyvee$	$\backslash bigcurlyvee$	$+$	$+$	$\backslash bigplus$	$\oint$	$\oint$	$\backslash landdownint$
$\curlyveedot$	$\curlyveedot$	$\backslash bigcurlyveeedot$	$\square$	$\square$	$\backslash bigsqcap$	$\oint$	$\oint$	$\backslash landupint$
$\curlywedge$	$\curlywedge$	$\backslash bigcurlywedge$	$\squaredot$	$\squaredot$	$\backslash bigsqcapdot$	$\oint$	$\oint$	$\backslash lcircleleftint$
$\curlywedgedot$	$\curlywedgedot$	$\backslash bigcurlywedgedot$	$\squareplus$	$\squareplus$	$\backslash bigsqcapplus$	$\oint$	$\oint$	$\backslash lcirclerightint$

(continued on next page)

(continued from previous page)

$\mathbb{W}$	$\mathbb{V}$	<code>\bigdoublecurlyvee</code>	$\sqcup$	$\sqcup$	<code>\bigsqcup</code>	$\oint$	$\oint$	<code>\oiint</code>
$\mathbb{A}$	$\mathbb{A}$	<code>\bigdoublecurlywedge</code>	$\sqcup$	$\sqcup$	<code>\bigsqcupdot</code>	$\oint$	$\oint$	<code>\oint</code>
$\mathbb{W}$	$\mathbb{W}$	<code>\bigdoublevee</code>	$\sqcup$	$\sqcup$	<code>\bigsqcupplus</code>	$\prod$	$\prod$	<code>\prod</code>
$\mathbb{A}$	$\mathbb{A}$	<code>\bigdoublewedge</code>	$\times$	$\times$	<code>\bigtimes</code>	$\oint$	$\oint$	<code>\rcircleleftint</code>
$\oplus$	$\otimes$	<code>\bigoast</code>	$\vee$	$\vee$	<code>\bigvee</code>	$\oint$	$\oint$	<code>\rcirclerightint</code>
$\oslash$	$\oslash$	<code>\bigobackslash</code>	$\forall$	$\forall$	<code>\bigveedot</code>	$f$	$f$	<code>\strokedint</code>
$\odot$	$\odot$	<code>\bigocirc</code>	$\wedge$	$\wedge$	<code>\bigwedge</code>	$\sum$	$\sum$	<code>\sum</code>
$\odot$	$\odot$	<code>\bigodot</code>	$\wedge$	$\wedge$	<code>\bigwedgedot</code>	$\oint$	$\oint$	<code>\sumint</code>

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

TABLE 65: `mathdesign` Variable-sized Math Operators

$\oint$	$\oint$	<code>\intclockwise</code>	$\oint$	$\oint$	<code>\ointclockwise</code>
$\oint\oint$	$\oint\oint$	<code>\oiint</code>	$\oint$	$\oint$	<code>\ointctrcclockwise</code>
$\oint\oint$	$\oint\oint$	<code>\oiint</code>			

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

TABLE 66: `cml` Large Math Operators

$\mathcal{D}$	<code>\bigparr</code>	&	<code>\bigwith</code>
---------------	-----------------------	---	-----------------------

TABLE 67: Binary Relations

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

\* Not predefined in L<sup>A</sup>T<sub>E</sub>X 2<sub><</sub>. Use one of the packages `latexsym`, `amsfonts`, `amssymb`, `mathabx`, `txfonts`, or `wasysym`.

† The difference between `\mid` and `|` is that the former is a binary relation while the latter is a math ordinal. Consequently, L<sup>A</sup>T<sub>E</sub>X typesets the two with different surrounding spacing. Contrast “P(A | B)”  $\mapsto$  “ $P(A|B)$ ” with “P(A \mid B)”  $\mapsto$  “ $P(A | B)$ ”.

 TABLE 68: *AMS* Binary Relations

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

 TABLE 69: *AMS* Negated Binary Relations

$\not\approx$	<code>\napprox</code>	$\not\models$	<code>\nshortparallel</code>	$\not\approx$	<code>\nVDash</code>
$\not\mid$	<code>\nmid</code>	$\not\sim$	<code>\nsim</code>	$\not\approx$	<code>\precnapprox</code>
$\not\parallel$	<code>\nparallel</code>	$\not\prec$	<code>\nsucc</code>	$\not\approx$	<code>\precnsim</code>
$\not\preceq$	<code>\npreceq</code>	$\not\preceq$	<code>\nsucceq</code>	$\not\approx$	<code>\succnapprox</code>
$\not\prec$	<code>\nprec</code>	$\not\approx$	<code>\nvDash</code>	$\not\approx$	<code>\succnnsim</code>
$\not\shortmid$	<code>\nshortmid</code>	$\not\approx$	<code>\nvDash</code>		

 TABLE 70: *stmaryrd* Binary Relations

$$\in \quad \text{\texttt{\textbackslash inplus}} \quad \ni \quad \text{\texttt{\textbackslash niplus}}$$

TABLE 71: wasysym Binary Relations

$\sqsubset$	<code>\invneg</code>	$\rightsquigarrow$	<code>\leadsto</code>	$\propto$	<code>\wasypromo</code>
$\bowtie$	<code>\Join</code>	$\circledast$	<code>\logof</code>		

TABLE 72: txfonts/pfxfonts Binary Relations

$\oslash$	<code>\circledgtr</code>	$\ltimes$	<code>\lJoin</code>	$\times$	<code>\opentimes</code>
$\oslash$	<code>\circledless</code>	$\bowtie$	<code>\lRtimes</code>	$\nparallel$	<code>\Perp</code>
$\approx$	<code>\colonapprox</code>	$\multimap$	<code>\multimap</code>	$\leqslant$	<code>\preceqq</code>
$\approx\approx$	<code>\Colonapprox</code>	$\multimapboth$	<code>\multimapboth</code>	$\nleqslant$	<code>\precneqq</code>
$\vdash$	<code>\coloneq</code>	$\multimapbothvert$	<code>\multimapbothvert</code>	$\rtimes$	<code>\rJoin</code>
$\vdash$	<code>\Coloneq</code>	$\multimapdot$	<code>\multimapdot</code>	$\trianglelefteq$	<code>\strictfi</code>
$\vdash\vdash$	<code>\Coloneqq</code>	$\multimapdotboth$	<code>\multimapdotboth</code>	$\exists$	<code>\strictif</code>
$\vdash\vdash$	<code>\coloneqq^*</code>	$\multimapdotbothA$	<code>\multimapdotbothA</code>	$\exists\exists$	<code>\strictiff</code>
$\approx\approx$	<code>\Colonsim</code>	$\multimapdotbothAvert$	<code>\multimapdotbothAvert</code>	$\geqslant$	<code>\succeqq</code>
$\approx\approx$	<code>\colonsim</code>	$\multimapdotbothB$	<code>\multimapdotbothB</code>	$\ngeqslant$	<code>\succneqq</code>
$\vdash\vdash$	<code>\Eqcolon</code>	$\multimapdotbothBvert$	<code>\multimapdotbothBvert</code>	$\parallel$	<code>\varparallel</code>
$\vdash\vdash$	<code>\eqcolon</code>	$\multimapdotbothvert$	<code>\multimapdotbothvert</code>	$\nparallel$	<code>\varparallelinv</code>
$\vdash\vdash$	<code>\eqqcolon</code>	$\multimapdotinv$	<code>\multimapdotinv</code>	$\nparallel$	<code>\VvDash</code>
$\approx\approx$	<code>\Eqqcolon</code>	$\multimapinv$	<code>\multimapinv</code>		
$\approx\approx$	<code>\eqsim</code>	$\times$	<code>\openJoin</code>		

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

TABLE 73: txfonts/pfxfonts Negated Binary Relations

$\not\approx$	<code>\napproxeq</code>	$\not\preccurlyeq$	<code>\npreccurlyeq</code>	$\not\approx$	<code>\nthickapprox</code>
$\not\approx$	<code>\nasmp</code>	$\not\preceq$	<code>\npreceq</code>	$\not\leftarrow$	<code>\ntwoheadleftarrow</code>
$\not\approx$	<code>\nbacksimeq</code>	$\not\precsim$	<code>\nprecsim</code>	$\not\rightarrow$	<code>\ntwoheadrightarrow</code>
$\not\approx$	<code>\nbacksimeq</code>	$\not\simeq$	<code>\nsimeq</code>	$\not\parallel$	<code>\nvarparallel</code>
$\not\approx$	<code>\nbump</code>	$\not\precapprox$	<code>\nprecapprox</code>	$\not\parallel$	<code>\nvarparallelinv</code>
$\not\approx$	<code>\nBump</code>	$\not\curlyeqsucc$	<code>\ncurlyeqsucc</code>	$\not\parallel$	<code>\nVdash</code>
$\not\approx$	<code>\nequiv</code>	$\not\succcurlyeq$	<code>\nsucccurlyeq</code>	$\not\parallel$	
$\not\approx$	<code>\nprecapprox</code>	$\not\succsim$	<code>\nsuccsim</code>		

TABLE 74: *mathabx* Binary Relations

$\between$	<code>\between</code>	$\mid$	<code>\divides</code>	$\therefore$	<code>\risingdotseq</code>
$\botdoteq$	<code>\botdoteq</code>	$\dot{\div}$	<code>\dotseq</code>	$\approx\!\!\!$	<code>\succapprox</code>
$\Bumpedeq$	<code>\Bumpedeq</code>	$\sqdot{\equiv}$	<code>\eqbumped</code>	$\asymp$	<code>\succcurlyeq</code>
$\bumpedeq$	<code>\bumpedeq</code>	$\equiv$	<code>\eqcirc</code>	$\triangleright$	<code>\succdot</code>
$\circeq$	<code>\circeq</code>	$\coloneqq$	<code>\eqcolon</code>	$\gtrsim$	<code>\succsim</code>
$\coloneq$	<code>\coloneq</code>	$\eqqcolon$	<code>\fallingdotseq</code>	$\therefore$	<code>\therefore</code>
$\corresponds$	<code>\corresponds</code>	$\ggcurlyeq$	<code>\topdoteq</code>	$\doteq$	
$\curlyeqprec$	<code>\curlyeqprec</code>	$\llcurlyeq$		$\vdash$	<code>\vDash</code>
$\curlyeqsucc$	<code>\curlyeqsucc</code>	$\asymp\!\!\!$	<code>\precapprox</code>	$\Vdash$	<code>\Vdash</code>
$\DashV$	<code>\DashV</code>	$\asymp\!\!\!$	<code>\preccurlyeq</code>	$\Vdash$	<code>\VDash</code>
$\Dashv$	<code>\Dashv</code>	$\triangleleft$	<code>\precdot</code>	$\Vdash$	<code>\Vvdash</code>
$\dashVv$	<code>\dashVv</code>	$\asymp\!\!\!$	<code>\precsim</code>	$\Vdash$	

 TABLE 75: *mathabx* Negated Binary Relations

$\not\approx$	<code>\napprox</code>	$\not\perp$	<code>\notperp</code>	$\not\models$	<code>\nvDash</code>
$\not\cong$	<code>\ncong</code>	$\not\prec$	<code>\notprec</code>	$\not\models$	<code>\nVdash</code>
$\not\curlyeqprec$	<code>\ncurlyeqprec</code>	$\not\approx\!\!\!$	<code>\nprecapprox</code>	$\not\models$	<code>\nVdash</code>
$\not\curlyeqsucc$	<code>\ncurlyeqsucc</code>	$\not\approx\!\!\!$	<code>\preccurlyeq</code>	$\not\models$	<code>\nvdash</code>
$\not\dashv$	<code>\Dashv</code>	$\not\preceq$	<code>\preceq</code>	$\not\models$	<code>\nVdash</code>
$\not\dashV$	<code>\DashV</code>	$\not\approx\!\!\!$	<code>\precsim</code>	$\not\models$	<code>\precnapprox</code>
$\not\dashhv$	<code>\Dashhv</code>	$\not\sim$	<code>\nsim</code>	$\not\models$	<code>\precneq</code>
$\not\dashhV$	<code>\DashhV</code>	$\not\approx\!\!\!$	<code>\nsimeq</code>	$\not\models$	<code>\precnsim</code>
$\not\dashhvV$	<code>\DashhvV</code>	$\not\approx\!\!\!$	<code>\nsucc</code>	$\not\models$	<code>\succnapprox</code>
$\not\eq$	<code>\neq</code>	$\not\approx\!\!\!$	<code>\nsuccapprox</code>	$\not\models$	<code>\succneq</code>
$\not\asymp$	<code>\notasymp</code>	$\not\approx\!\!\!$	<code>\nsucccurlyeq</code>	$\not\models$	<code>\succnsim</code>
$\not\divides$	<code>\notdivides</code>	$\not\approx\!\!\!$	<code>\nsucceq</code>		
$\not\equiv$	<code>\notequiv</code>	$\not\approx\!\!\!$	<code>\nsuccsim</code>		

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

 TABLE 76: *MnSymbol* Binary Relations

$\approx$	<code>\approx</code>	$\approx$	<code>\eqbump</code>	$\wedge$	<code>\nwfootline</code>	$\nwarrow$	<code>\seVdash</code>
$\approx$	<code>\approxeq</code>	$\approx$	<code>\eqcirc</code>	$\nwarrow$	<code>\nwfree</code>	$\parallel$	<code>\shortparallel</code>
$\approx$	<code>\backapprox</code>	$\approx$	<code>\eqdot</code>	$\asymp$	<code>\nwmodels</code>	$\sim$	<code>\sim</code>
$\approx$	<code>\backapproxeq</code>	$\approx$	<code>\eqsim</code>	$\asymp$	<code>\nwModels</code>	$\simeq$	<code>\simeq</code>
$\approx$	<code>\backcong</code>	$\approx$	<code>\equal</code>	$+$	<code>\nwsecrossing</code>	$>$	<code>\succ</code>
$\approx$	<code>\backeqsim</code>	$\approx$	<code>\equalclosed</code>	$\backslash$	<code>\nwsepline</code>	$\gtrapprox$	<code>\succapprox</code>

(continued on next page)

(continued from previous page)

$\backsim$	<code>\backsim</code>	$\equiv$	<code>\equiv</code>	$\approxeq$	<code>\Nwseqlne</code>	$\succcurlyeq$	<code>\succcurlyeq</code>
$\backsimeq$	<code>\backsimeq</code>	$\boxdot$	<code>\equivclosed</code>	$\succdot$	<code>\nwvDash</code>	$\succeq$	<code>\succeq</code>
$\backtriplesim$	<code>\backtriplesim</code>	$\asymp$	<code>\fallingdotseq</code>	$\succcurlyeq$	<code>\nwVdash</code>	$\succsim$	<code>\succsim</code>
$\between$	<code>\between</code>	$\trianglelefteq$	<code>\hateq</code>	$\prec$	<code>\prec</code>	$\swfootline$	<code>\swfootline</code>
$\bumpeq$	<code>\bumpeq</code>	$\times$	<code>\hcrossing</code>	$\approx$	<code>\precapprox</code>	$\swfree$	<code>\swfree</code>
$\Bumpeq$	<code>\Bumpeq</code>	$\vdash$	<code>\leftfootline</code>	$\lessapprox$	<code>\preccurlyeq</code>	$\swmodels$	<code>\swmodels</code>
$\circeq$	<code>\circeq</code>	$\leftarrow$	<code>\leftfree</code>	$\leq$	<code>\preceq</code>	$\swModels$	<code>\swModels</code>
$\closedeq$	<code>\closedeq</code>	$\equiv$	<code>\leftmodels</code>	$\gtrapprox$	<code>\precsim</code>	$\swvDash$	<code>\swvDash</code>
$\closedprec$	<code>\closedprec</code>	$\Vdash$	<code>\leftModels</code>	$\vdash$	<code>\rightfootline</code>	$\swVDash$	<code>\swVDash</code>
$\closedsucc$	<code>\closedsucc</code>	$\infty$	<code>\leftpropto</code>	$\rightarrow$	<code>\rightfree</code>	$\triplesim$	<code>\triplesim</code>
$\coloneq$	<code>\coloneq</code>	$-$	<code>\leftrightline</code>	$\vDash$	<code>\rightmodels</code>	$\updownline$	<code>\updownline</code>
$\cong$	<code>\cong</code>	$=$	<code>\Leftrightline</code>	$\Vdash$	<code>\rightModels</code>	$\Updownline$	<code>\Updownline</code>
$\curlyeqprec$	<code>\curlyeqprec</code>	$\triangleleft$	<code>\leftslice</code>	$\infty$	<code>\rightpropto</code>	$\upfootline$	<code>\upfootline</code>
$\curlyeqsucc$	<code>\curlyeqsucc</code>	$\dashv$	<code>\leftvdash</code>	$\triangleright$	<code>\rightslice</code>	$\upfree$	<code>\upfree</code>
$\doteq$	<code>\doteq</code>	$\dashv$	<code>\leftVdash</code>	$\vdash$	<code>\rightVdash</code>	$\upmodels$	<code>\upmodels</code>
$\Doteq$	<code>\Doteq</code>	$\wedge$	<code>\nefootline</code>	$\Vdash$	<code>\rightVdash</code>	$\upModels$	<code>\upModels</code>
$\downfootline$	<code>\downfootline</code>	$\nearrow$	<code>\nefree</code>	$\eqqcolon$	<code>\risingdotseq</code>	$\uppropto$	<code>\uppropto</code>
$\downfree$	<code>\downfree</code>	$\nwarrow$	<code>\nemodels</code>	$\succdot$	<code>\sefootline</code>	$\upvDash$	<code>\upvDash</code>
$\downmodels$	<code>\downmodels</code>	$\nwarrow$	<code>\neModels</code>	$\succdot$	<code>\sefree</code>	$\upvDash$	<code>\upvDash</code>
$\downModel$	<code>\downModel</code>	$\nearrow$	<code>\neswline</code>	$\nwarrow$	<code>\semmodels</code>	$\vcrossing$	<code>\vcrossing</code>
$\downpropto$	<code>\downpropto</code>	$\approxeq$	<code>\Neswline</code>	$\nwarrow$	<code>\seModels</code>	$\VvDash$	<code>\VvDash</code>
$\downvDash$	<code>\downvDash</code>	$\checkmark$	<code>\nevDash</code>	$\circ$	<code>\separated</code>		
$\downVdash$	<code>\downVdash</code>	$\nwarrow$	<code>\neVDash</code>	$\wedge$	<code>\sevDash</code>		

MnSymbol additionally defines synonyms for some of the preceding symbols:

$\dashv$	<code>\dashv</code>	(same as <code>\leftVdash</code> )
$\diagdown$	<code>\diagdown</code>	(same as <code>\nwseqlne</code> )
$\diagup$	<code>\diagup</code>	(same as <code>\neswline</code> )
$\divides$	<code>\divides</code>	(same as <code>\updownline</code> )
$\doteqdot$	<code>\doteqdot</code>	(same as <code>\Doteq</code> )
$\models$	<code>\models</code>	(same as <code>\rightmodels</code> )
$\parallel$	<code>\parallel</code>	(same as <code>\Updownline</code> )
$\perp$	<code>\perp</code>	(same as <code>\upvDash</code> )
$\propto$	<code>\propto</code>	(same as <code>\leftpropto</code> )
$\relbar$	<code>\relbar</code>	(same as <code>\leftrightline</code> )
$\Relbar$	<code>\Relbar</code>	(same as <code>\Leftrightline</code> )
$\varpropto$	<code>\varpropto</code>	(same as <code>\leftpropto</code> )
$\vDash$	<code>\vDash</code>	(same as <code>\rightmodels</code> )
$\VDash$	<code>\VDash</code>	(same as <code>\rightModels</code> )
$\vdash$	<code>\vdash</code>	(same as <code>\rightVdash</code> )
$\Vdash$	<code>\Vdash</code>	(same as <code>\rightVdash</code> )

TABLE 77: MnSymbol Negated Binary Relations

$\not\approx$	<code>\napprox</code>	$\not\neq$	<code>\neqsim</code>	$\not\asymp$	<code>\nnwModels</code>	$\not\asymp$	<code>\nsucc</code>
$\not\approx$	<code>\napproxeq</code>	$\not\equiv$	<code>\nequal</code>	$\times$	<code>\nnwsepline</code>	$\not\asymp$	<code>\nsuccapprox</code>
$\not\approx$	<code>\nbackapprox</code>	$\not\equiv$	<code>\nequalsclosed</code>	$\not\asymp$	<code>\nNwseline</code>	$\not\asymp$	<code>\nsucccurlyeq</code>
$\not\approx$	<code>\nbackapproxeq</code>	$\not\equiv$	<code>\nequiv</code>	$\not\asymp$	<code>\nnwvdash</code>	$\not\asymp$	<code>\nsucceq</code>
$\not\approx$	<code>\nbackcong</code>	$\not\equiv$	<code>\nequivclosed</code>	$\not\asymp$	<code>\nnwVdash</code>	$\not\asymp$	<code>\nsuccsim</code>
$\not\approx$	<code>\nbackeqsim</code>	$\not\equiv$	<code>\nescrossing</code>	$\not\asymp$	<code>\npref</code>	$\not\asymp$	<code>\nswfootline</code>
$\not\approx$	<code>\nbacksimeq</code>	$\not\equiv$	<code>\nfallingdotseq</code>	$\not\asymp$	<code>\nprecapprox</code>	$\not\asymp$	<code>\nswfree</code>
$\not\approx$	<code>\nbacksimeq</code>	$\not\equiv$	<code>\nhateq</code>	$\not\asymp$	<code>\npreeq</code>	$\not\asymp$	<code>\nswmodels</code>
$\not\approx$	<code>\nbacktriplesim</code>	$\not\vdash$	<code>\nleftfootline</code>	$\not\asymp$	<code>\npreceq</code>	$\not\asymp$	<code>\nswModels</code>
$\not\approx$	<code>\nbumppeq</code>	$\not\vdash$	<code>\nleftfree</code>	$\not\asymp$	<code>\npresim</code>	$\not\asymp$	<code>\nswvdash</code>
$\not\approx$	<code>\nBumpeq</code>	$\not\equiv$	<code>\nleftmodels</code>	$\not\vdash$	<code>\nrightfootline</code>	$\not\asymp$	<code>\nswVdash</code>
$\not\approx$	<code>\ncirceq</code>	$\not\equiv$	<code>\nleftModels</code>	$\not\vdash$	<code>\nrightfree</code>	$\not\asymp$	<code>\ntriplesim</code>
$\not\equiv$	<code>\nclosedequal</code>	$\not\vdash$	<code>\nleftrightline</code>	$\not\#$	<code>\nrightmodels</code>	$\not\vdash$	<code>\nupdownline</code>
$\not\approx$	<code>\ncong</code>	$\not\equiv$	<code>\nLeftrightline</code>	$\not\#$	<code>\nrightModels</code>	$\not\#$	<code>\nUpdownline</code>
$\not\approx$	<code>\ncurlyeqprec</code>	$\not\vdash$	<code>\nleftvDash</code>	$\not\vdash$	<code>\nrightvDash</code>	$\not\vdash$	<code>\nupfootline</code>
$\not\approx$	<code>\ncurlyeqsucc</code>	$\not\vdash$	<code>\nleftVdash</code>	$\not\#$	<code>\nrightVdash</code>	$\not\vdash$	<code>\nupfree</code>
$\not\approx$	<code>\ndoteq</code>	$\not\asymp$	<code>\nnefootline</code>	$\not\#$	<code>\nrisingdotseq</code>	$\not\#$	<code>\nupmodels</code>
$\not\approx$	<code>\nDoteq</code>	$\not\asymp$	<code>\nnefree</code>	$\not\asymp$	<code>\nsefootline</code>	$\not\asymp$	<code>\nupModels</code>
$\pm$	<code>\ndownfootline</code>	$\not\asymp$	<code>\nnemodels</code>	$\not\asymp$	<code>\nsefree</code>	$\pm$	<code>\nupvDash</code>
$\pm$	<code>\ndownfree</code>	$\not\asymp$	<code>\nneModels</code>	$\not\asymp$	<code>\nsemmodels</code>	$\pm$	<code>\nupVdash</code>
$\mp$	<code>\ndownmodels</code>	$\not\asymp$	<code>\nnesline</code>	$\not\asymp$	<code>\nseModels</code>	$\not\asymp$	<code>\precnapprox</code>
$\mp$	<code>\ndownModels</code>	$\not\asymp$	<code>\nNesline</code>	$\not\asymp$	<code>\nsevDash</code>	$\not\asymp$	<code>\precnsim</code>
$\mp$	<code>\ndownvDash</code>	$\not\asymp$	<code>\nnevDash</code>	$\not\asymp$	<code>\nseVdash</code>	$\not\asymp$	<code>\succnapprox</code>
$\mp$	<code>\ndownVDash</code>	$\not\asymp$	<code>\nneVdash</code>	$\not\asymp$	<code>\nshortmid</code>	$\not\asymp$	<code>\succnsim</code>
$\not\approx$	<code>\neqbump</code>	$\not\asymp$	<code>\nnwfootline</code>	$\not\asymp$	<code>\nshortparallel</code>		
$\not\approx$	<code>\neqcirc</code>	$\not\asymp$	<code>\nnwfree</code>	$\not\asymp$	<code>\nsim</code>		
$\not\approx$	<code>\neqdot</code>	$\not\asymp$	<code>\nnwmodels</code>	$\not\asymp$	<code>\nsimeq</code>		

MnSymbol additionally defines synonyms for some of the preceding symbols:

$\not\vdash$	<code>\ndashv</code>	(same as <code>\nleftvDash</code> )
$\not\asymp$	<code>\ndiagdown</code>	(same as <code>\nnwsepline</code> )
$\not\asymp$	<code>\ndiagup</code>	(same as <code>\nnesline</code> )
$\not\vdash$	<code>\ndivides</code>	(same as <code>\nupdownline</code> )
$\not\equiv$	<code>\ne</code>	(same as <code>\nequal</code> )
$\not\equiv$	<code>\neq</code>	(same as <code>\nequal</code> )
$\not\vdash$	<code>\nmid</code>	(same as <code>\nupdownline</code> )
$\not\#$	<code>\nmodels</code>	(same as <code>\nrightmodels</code> )
$\not\#$	<code>\nparallel</code>	(same as <code>\nUpdownline</code> )
$\pm$	<code>\nperp</code>	(same as <code>\nupvDash</code> )
$\not\vdash$	<code>\nrelbar</code>	(same as <code>\nleftrightline</code> )
$\not\equiv$	<code>\nRelbar</code>	(same as <code>\nLeftrightline</code> )
$\not\#$	<code>\nvDash</code>	(same as <code>\nrightmodels</code> )
$\not\vdash$	<code>\nvdash</code>	(same as <code>\nrightvDash</code> )
$\not\#$	<code>\nVdash</code>	(same as <code>\nrightVdash</code> )
$\not\#$	<code>\nVDash</code>	(same as <code>\nrightModels</code> )

TABLE 78: mathtools Binary Relations

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

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

$$\text{=:} \quad \text{vs.} \quad \text{=:}\text{\vcentcolon}$$

TABLE 79: turnstile Binary Relations

	<code>\dddtstile{abc}{def}</code>		<code>\nntstile{abc}{def}</code>		<code>\stdtstile{abc}{def}</code>
	<code>\ddststile{abc}{def}</code>		<code>\nnttstile{abc}{def}</code>		<code>\stststile{abc}{def}</code>
	<code>\ddtstile{abc}{def}</code>		<code>\nsdtstile{abc}{def}</code>		<code>\sttstile{abc}{def}</code>
	<code>\ddttstile{abc}{def}</code>		<code>\nsststile{abc}{def}</code>		<code>\stttstile{abc}{def}</code>
	<code>\ndtstile{abc}{def}</code>		<code>\nststile{abc}{def}</code>		<code>\tddtstile{abc}{def}</code>
	<code>\dnststile{abc}{def}</code>		<code>\nstattile{abc}{def}</code>		<code>\tdststile{abc}{def}</code>
	<code>\dntstile{abc}{def}</code>		<code>\ntdtstile{abc}{def}</code>		<code>\tdtstile{abc}{def}</code>
	<code>\dnttstile{abc}{def}</code>		<code>\ntststile{abc}{def}</code>		<code>\tdttstile{abc}{def}</code>
	<code>\dsdtstile{abc}{def}</code>		<code>\nttstile{abc}{def}</code>		<code>\tndtstile{abc}{def}</code>
	<code>\dsststile{abc}{def}</code>		<code>\ntttstile{abc}{def}</code>		<code>\tnststile{abc}{def}</code>
	<code>\dststile{abc}{def}</code>		<code>\sddtstile{abc}{def}</code>		<code>\tnststile{abc}{def}</code>
	<code>\dstattile{abc}{def}</code>		<code>\sdststile{abc}{def}</code>		<code>\tnttstile{abc}{def}</code>
	<code>\dtdtstile{abc}{def}</code>		<code>\sdtstile{abc}{def}</code>		<code>\tsdtstile{abc}{def}</code>
	<code>\dtststile{abc}{def}</code>		<code>\sdttstile{abc}{def}</code>		<code>\tsststile{abc}{def}</code>

(continued on next page)

(continued from previous page)

	$\backslash dttstile{abc}{def}$		$\backslash sndtstile{abc}{def}$		$\backslash tststile{abc}{def}$
	$\backslash dtttstile{abc}{def}$		$\backslash snststile{abc}{def}$		$\backslash ttttstile{abc}{def}$
	$\backslash nddtstile{abc}{def}$		$\backslash sntstile{abc}{def}$		$\backslash tttdstile{abc}{def}$
	$\backslash ndststile{abc}{def}$		$\backslash snttstile{abc}{def}$		$\backslash ttststile{abc}{def}$
	$\backslash ndtstile{abc}{def}$		$\backslash ssdtstile{abc}{def}$		$\backslash ttttstile{abc}{def}$
	$\backslash ndttstile{abc}{def}$		$\backslash ssststile{abc}{def}$		$\backslash tttttstile{abc}{def}$
	$\backslash nnststile{abc}{def}$		$\backslash sststile{abc}{def}$		
	$\backslash nnsttstile{abc}{def}$				

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: *trs*ym Binary Relations

$\bullet\circ$	$\backslash InversTransformHoriz$	$\circ\bullet$	$\backslash TransformHoriz$
$\bullet\circ$	$\backslash InversTransformVert$	$\circ\bullet$	$\backslash TransformVert$

TABLE 81: *trfs*igns Binary Relations

$\circ\swarrow$	$\backslash dfourier$	$\searrow\circ$	$\backslash Dfourier$
$\circ\text{---}$	$\backslash ffourier$	$\text{---}\circ$	$\backslash Fourier$
$\circ\bullet\text{---}$	$\backslash laplace$	$\bullet\text{---}\circ$	$\backslash Laplace$
$\circ\swarrow\bullet$	$\backslash ztransf$	$\bullet\searrow\circ$	$\backslash Ztransf$

TABLE 82: *cml*l Binary Relations

$\circ\text{---}$	$\backslash coh$	$\text{---}\circ$	$\backslash scoh$
$\asymp\text{---}$	$\backslash incoh$	$\text{---}\asymp$	$\backslash sincoh$

TABLE 83: `colonequals` Binary Relations

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

TABLE 84: `fourier` Binary Relations

# `\nparallelslant // \parallelslant`

TABLE 85: Subset and Superset Relations

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

\* Not predefined in L<sup>A</sup>T<sub>E</sub>X 2 <sub>$\varepsilon$</sub> . Use one of the packages `latexsym`, `amsfonts`, `amssymb`, `mathabx`, `txfonts`, `pxfonts`, or `wasysym`.

TABLE 86: `AMSS` Subset and Superset Relations

$\not\sqsubset$	<code>\nsqsubseteq</code>	$\sqsubseteq$	<code>\subsetneqq</code>	$\supset$	<code>\supsetneqq</code>
$\not\sqsupset$	<code>\nsupseteq</code>	$\sqsupseteq$	<code>\supsetneqq</code>	$\not\supset$	<code>\varsubsetneqq</code>
$\not\sqsupseteq$	<code>\nsupseteqq</code>	$\sqsupseteqq$	<code>\supsetneqqq</code>	$\not\supseteq$	<code>\varsubsetneqqq</code>
$\sqsubset$	<code>\sqsubset</code>	$\supset$	<code>\Supset</code>	$\not\supseteq$	<code>\varsupsetneqq</code>
$\sqsupset$	<code>\sqsupset</code>	$\supseteq$	<code>\supseteqq</code>	$\not\supseteq$	<code>\varsupsetneqqq</code>
$\Subset$	<code>\Subset</code>	$\supseteqq$	<code>\supsetneqq</code>	$\not\supseteqq$	<code>\varsubsetneqqq</code>

TABLE 87: `stmaryrd` Subset and Superset Relations

$\Subset$  `\subsetplus`     $\Supset$  `\supsetplus`  
 $\Subset$  `\subsetplusseq`     $\Supset$  `\supsetplusseq`

TABLE 88: `wasysym` Subset and Superset Relations

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

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

$\not\sqsubset$	<code>\nsqsubset</code>	$\not\sqsupset$	<code>\nsqsupset</code>	$\not\supset$	<code>\nSupset</code>
$\not\sqsubseteq$	<code>\nsqsubseteq</code>	$\not\sqsupseteq$	<code>\nsqsupseteq</code>	$\not\supseteq$	<code>\nSupseteq</code>
$\not\sqsupset$	<code>\nsupset</code>	$\not\sqsupseteq$	<code>\nsupseteq</code>	$\not\supseteqq$	<code>\nSupseteqq</code>

TABLE 90: mathabx Subset and Superset Relations

+	\nsqsubset	+	\nsupset	⊐	\sqsupseteq	⊑	\supseteq
⤒	\nsqSubset	⤒	\nSupset	⊓	\sqsupseteqqq	⊔	\supseteqqq
⤓	\nsqsubseteq	⤓	\nsupseteq	⊔	\sqsupsetneq	⊓	\supsetneq
⤔	\nsqsubseteqqq	⤔	\nsupseteqqq	⊔	\sqsupsetneqq	⊓	\supsetneqq
⤖	\nsqsupset	⤖	\sqsubset	⊏	\subset	⊏	\varsqsubsetneq
⤗	\nsqSupset	⤗	\sqSubset	⊏	\Subset	⊏	\varsqsubsetneqq
⤘	\nsqsubseteq	⤘	\sqsubseteq	⊏	\subseteq	⊏	\varsqsupsetneq
⤙	\nsqsubseteqqq	⤙	\sqsubseteqqq	⊏	\subseteqqq	⊏	\varsqsupsetneqq
⤚	\nsubset	⤚	\sqsubsetneq	⊏	\subsetneq	⊏	\varsubsetneq
⤛	\nSubset	⤛	\sqsubsetneqq	⊏	\subsetneqq	⊏	\varsubsetneqq
⤜	\nsubseteq	⤜	\sqSupset	⊏	\supset	⊏	\varsupsetneq
⤝	\nsubseteqqq	⤝	\sqsupset	⊏	\Supset	⊏	\varsupsetneqq

TABLE 91: MnSymbol Subset and Superset Relations

≠	\nSqsubset	≠	\nsubseteq	≠	\sqsubsetneq	⊆	\subseteq
≠	\nsqsubset	≠	\nsubseteqqq	≠	\sqsubsetneqq	⊆	\subseteqqq
≠	\nsqsubseteq	⤒	\nSupset	⊓	\Sqsupset	⊏	\subsetneq
≠	\nsqsubseteqqq	⤒	\nsupset	⊏	\sqsupset	⊏	\subsetneqq
⤒	\nSqsupset	⤒	\nsupseteq	⊓	\sqsupseteq	⊔	\Supset
⤒	\nsqsupset	⤒	\nsupseteqqq	⊓	\sqsupseteqqq	⊔	\Supset
⤓	\nsqsupseteq	⤓	\Sqsubset	⊓	\sqsupsetneq	⊑	\supseteq
⤓	\nsqsupseteqqq	⤓	\sqsubset	⊓	\sqsupsetneqq	⊑	\supseteqqq
≠	\nSubset	⊑	\sqsubseteq	⊑	\Subset	⊑	\supsetneq
≠	\nsubset	⊑	\sqsubsetneqq	⊑	\subsetneqq	⊑	\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: *AMS* Inequalities

$\geqslant$	$\geqslantgtr$	$\gtreqdot$	$\leqslant$	$\leqslantgtr$	$\ngeq$	$\ngeq$
$\leqslant$	$\leqslantless$	$\gtreqless$	$\geqslant$	$\geqslantqqtr$	$\ngeqq$	$\ngeqq$
$\geqslanteqq$		$\gtreqqless$	$\leqslant$	$\lessgtr$	$\ngeqslant$	$\ngeqslant$
$\geqslantlant$		$\gtreqless$	$\geqslantsim$		$\ngtr$	$\ngtr$
$\ggg$		$\gtreqsim$	$\lll$		$\nleq$	$\nleq$
$\gnapprox$		$\gvertneqq$	$\lnapprox$		$\nleqq$	$\nleqq$
$\gneq$		$\leqq$	$\lneq$		$\nleqslant$	$\nleqslant$
$\gneqq$		$\leqslant$	$\lneqq$		$\nless$	$\nless$
$\gnsim$		$\lessapprox$	$\lnsim$			
$\gtrapprox$		$\lessdot$	$\lvertneqq$			

TABLE 94: *wasysym* Inequalities
 $\gtrsim \apprge \lesssim \apprle$ 
TABLE 95: *txfonts/pxfonts* Inequalities

$\gg$	$\ngg$	$\ngeq$	$\ngtrsim$	$\ngeq$	$\nlesssim$
$\geq$	$\ngtrapprox$	$\ngeq$	$\lessapprox$	$\nless$	$\nll$
$\geqslant$	$\ngtrless$	$\ngeq$	$\lessgtr$		

TABLE 96: mathabx Inequalities

$\geq$	$\eqslantgtr$	$\wedge\vee$	$\gtreqless$	$\lesssim$	$\lessapprox$	$\ngtr$
$\leq$	$\eqslantless$	$\wedge\vee$	$\gtreqqless$	$\ll$	$\lll$	$\ngtrapprox$
$\geq$	$\geq$	$\wedge\vee$	$\gtrless$	$\lll$	$\lll$	$\ngtrsim$
$\leq$	$\geqq$	$\wedge\vee$	$\gtrsim$	$\lessapprox$	$\lnapprox$	$\nleq$
$\gg$	$\gg$	$\wedge\vee$	$\gvertneqq$	$\leq$	$\lneq$	$\nleqq$
$\ggg$	$\ggg$	$\wedge\vee$	$\leq$	$\lneqq$	$\lneqq$	$\nless$
$\gapprox$	$\gapprox$	$\wedge\vee$	$\leqq$	$\lnsim$	$\lnsim$	$\nlessapprox$
$\gneq$	$\gneq$	$\wedge\vee$	$\lessapprox$	$\lvertneqq$	$\lvertneqq$	$\nlesssim$
$\gneqq$	$\gneqq$	$\wedge\vee$	$\lessdot$	$\neq$	$\neq$	$\nvareq$
$\gnsim$	$\gnsim$	$\wedge\vee$	$\lesseqgtr$	$\neq$	$\neq$	$\nvarleq$
$\gtrapprox$	$\gtrapprox$	$\wedge\vee$	$\lesseqgtr$	$\neq$	$\neq$	$\vareq$
$\gtrdot$	$\gtrdot$	$\wedge\vee$	$\lessgtr$	$\neq$	$\neq$	$\varleq$

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

TABLE 97: MnSymbol Inequalities

$\geqslantgt$	$\leqslantgtr$	$\geqslantless$	$\leqslantsim$	$\geqslantapprox$	$\leqslantlessim$	$\geqslantreqless$
$\leqslantless$	$\geqslantless$	$\leqslantgtr$	$\geqslantlessim$	$\leqslantgt$	$\geqslantlessslant$	$\geqslantreqless$
$\geqeq$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\geqclosed$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\geqdot$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\geqq$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\geqslant$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\geqslantdot$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\geqslantapprox$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\geqapprox$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\gg$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\ggg$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\gnapprox$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\gneqq$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\gnsim$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\gtr$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\gtrapprox$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\gtrclosed$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\gtrdot$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\gtreqless$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$
$\gtreqlesslant$	$\geqslantless$	$\geqslantless$	$\geqslantlessim$	$\geqslantless$	$\geqslantless$	$\geqslantreqless$

MnSymbol additionally defines synonyms for some of the preceding symbols:

$\gggtr$	(same as $\ggg$ )
$\gvertneqq$	(same as $\gneqq$ )
$\lhd$	(same as $\lessclosed$ )
$\llless$	(same as $\lll$ )
$\lvertneqq$	(same as $\lneqq$ )
$\ntrianglelefteq$	(same as $\neqclosed$ )
$\ntriangleleft$	(same as $\lessclosed$ )
$\ntrianglerighteq$	(same as $\eqclosed$ )
$\ntriangleright$	(same as $\gtreqclosed$ )
$\rhd$	(same as $\gtreqclosed$ )
$\trianglelefteq$	(same as $\eqclosed$ )
$\trianglerighteq$	(same as $\geqclosed$ )
$\unlhd$	(same as $\leqclosed$ )
$\unrhd$	(same as $\geqclosed$ )
$\vartriangleleft$	(same as $\lessclosed$ )
$\vartriangleright$	(same as $\gtreqclosed$ )

TABLE 98: *AMS* Triangle Relations

$\blacktriangleleft$	<code>\blacktriangleleft</code>	$\not\triangleright$	<code>\ntriangleright</code>	$\trianglerighteq$	<code>\trianglerighteq</code>
$\blacktriangleright$	<code>\blacktriangleright</code>	$\not\trianglerighteq$	<code>\ntrianglerighteq</code>	$\triangleleft$	<code>\vartriangleleft</code>
$\not\triangleleft$	<code>\ntriangleleft</code>	$\trianglelefteq$	<code>\trianglelefteq</code>	$\trianglegt$	<code>\vartriangleright</code>
$\not\trianglelefteq$	<code>\ntrianglelefteq</code>	$\triangleq$	<code>\triangleq</code>		

TABLE 99: *stmaryrd* Triangle Relations

$\trianglelefteqslant$	<code>\trianglelefteqslant</code>	$\trianglerighteqslant$	<code>\trianglerighteqslant</code>
$\not\trianglelefteqslant$	<code>\ntrianglelefteqslant</code>	$\not\trianglerighteqslant$	<code>\ntrianglerighteqslant</code>

TABLE 100: *mathabx* Triangle Relations

$\not\triangleleft$	<code>\ntriangleleft</code>	$\not\trianglelefteq$	<code>\ntrianglelefteq</code>	$\triangleright$	<code>\triangleright</code>	$\trianglerighteq$	<code>\trianglerighteq</code>	$\vartriangleright$	<code>\vartriangleright</code>
$\not\trianglelefteq$	<code>\ntrianglelefteq</code>	$\triangleleft$	<code>\triangleleft</code>	$\trianglerighteq$	<code>\trianglerighteq</code>				
$\not\triangleright$	<code>\ntriangleright</code>	$\trianglelefteq$	<code>\trianglelefteq</code>	$\triangleleft$	<code>\triangleleft</code>	$\trianglegt$	<code>\trianglegt</code>	$\vartriangleleft$	<code>\vartriangleleft</code>

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	▷	\vartrianglerighteq
▶	\largetriangleright	▷	\ntrianglelefteq	▷	\vartrianglelefteq

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; \lessclosed is a synonym for \ntriangleleft; \ngtrclosed is a synonym for \ntrianglelefteq; \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	←	\longleftarrow	↖	\nwarrow
↓	\downarrow	⇐	\Longleftarrow	⇒	\Rrightarrow
↔	\hookleftarrow	↔	\longleftrightarrow	→	\rightarrow
↔	\hookrightarrow	↔	\Longleftrightarrow	↙	\searrow
⇝	\leadsto*	↦	\longmapsto	↙	\swarrow
←	\leftarrow	⇒	\Longrightarrow	↑	\uparrow
⇐	\Leftarrow	⇒	\longrightarrow	↑	\Uparrow
⇒	\Leftrightarrow	⇒	\mapsto	↑↓	\updownarrow
↔	\leftrightsquigarrow	↗	\nearrow†	↔	\Updownarrow

\* Not predefined in LATEX 2 $\varepsilon$ . 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 “ $\nabla \cdot \overset{0}{\overbrace{B}}$ ”).

TABLE 103: Harpoons

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

TABLE 104: *textcomp* Text-mode Arrows

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

TABLE 105: *AMS* Arrows

$\circlearrowleft$	<code>\circlearrowleft</code>	$\Leftarrow$	<code>\leftleftarrows</code>	$\rightleftharpoons$	<code>\rightleftarrows</code>
$\circlearrowright$	<code>\circlearrowright</code>	$\Leftrightarrow$	<code>\leftrightarrows</code>	$\rightleftharpoons$	<code>\rightleftharpoons</code>
$\curvearrowleft$	<code>\curvearrowleft</code>	$\rightsquigarrow$	<code>\leftrightsquigarrow</code>	$\rightsquigarrow$	<code>\rightsquigarrow</code>
$\curvearrowright$	<code>\curvearrowright</code>	$\Leftarrow$	<code>\Lleftarrow</code>	$\Rsh$	<code>\Rsh</code>
$\dashleftarrow$	<code>\dashleftarrow</code>	$\Leftarrow\rho$	<code>\looparrowleft</code>	$\twoheadleftarrow$	<code>\twoheadleftarrow</code>
$\dashrightarrow$	<code>\dashrightarrow</code>	$\Rightarrow\rho$	<code>\looparrowright</code>	$\twoheadrightarrow$	<code>\twoheadrightarrow</code>
$\downdownarrows$	<code>\downdownarrows</code>	$\Downarrow$	<code>\Lsh</code>	$\upuparrows$	<code>\upuparrows</code>
$\leftarrowtail$	<code>\leftarrowtail</code>	$\rightarrowtail$	<code>\rightarrowtail</code>		

TABLE 106: *AMS* Negated Arrows

$\not\Leftarrow$	<code>\nLeftarrow</code>	$\not\Rightarrow$	<code>\nRightarrow</code>	$\not\rightarrow$	<code>\nrightarrow</code>
$\not\Leftarrow$	<code>\nleftarrow</code>	$\not\Rightarrow$	<code>\nrightarrow</code>	$\not\rightarrow$	<code>\nrightarrow</code>

TABLE 107: *AMS* Harpoons

$\downarrow$	<code>\downharpoonleft</code>	$\Leftarrow$	<code>\leftrightharpoons</code>	$\uparrow$	<code>\upharpoonleft</code>
$\downarrow$	<code>\downharpoonright</code>	$\Rightarrow$	<code>\rightleftharpoons</code>	$\uparrow$	<code>\upharpoonright</code>

TABLE 108: *stmaryrd* Arrows

$\leftarrow$	<code>\leftarrowtriangle</code>	$\Leftarrow$	<code>\Mapsfrom</code>	$\leftarrow$	<code>\shortleftarrow</code>
$\Leftarrow$	<code>\leftrightharpoons</code>	$\Leftarrow$	<code>\mapsfrom</code>	$\rightarrow$	<code>\shortrightarrow</code>
$\Leftrightarrow$	<code>\leftrightharpoons</code>	$\Rightarrow$	<code>\Mapsto</code>	$\uparrow$	<code>\shortuparrow</code>
$\swarrow$	<code>\lightning</code>	$\nearrow$	<code>\lnearrow</code>	$\searrow$	<code>\ssearrow</code>
$\Longleftarrow$	<code>\Longmapsfrom</code>	$\nearrow$	<code>\lnnarrow</code>	$\swarrow$	<code>\sswarrow</code>
$\Longleftarrow$	<code>\longmapsfrom</code>	$\rightarrow$	<code>\rightarrowtriangle</code>		
$\Longrightarrow$	<code>\Longmapsto</code>	$\downarrow$	<code>\shortdownarrow</code>		

TABLE 109: txfonts/pxfonts Arrows

$\Leftarrow \square$	$\boxdotLeft$	$\Rightarrow \circlearrowright$	$\circlearrowleft \square$	$\boxdotRight$	$\Leftarrow \diamond$	$\circleddotright$	$\Rightarrow \diamond$	$\circleddotleft$	$\Leftarrow \diamond$	$\Diamondleft$
$\Leftarrow \square$	$\boxdotleft$	$\Rightarrow \circlearrowleft$	$\circlearrowright \square$	$\boxdotleft$	$\Leftarrow \diamond$	$\circlearrowleft$	$\Rightarrow \diamond$	$\circlearrowright$	$\Leftarrow \diamond$	$\Diamondright$
$\square \Rightarrow$	$\boxdotright$	$\square \Rightarrow \circlearrowright$	$\circlearrowleft \square$	$\boxdotright$	$\square \Rightarrow \diamond$	$\circlearrowright$	$\square \Rightarrow \diamond$	$\circlearrowleft$	$\square \Rightarrow \diamond$	$\Diamondright$
$\square \Rightarrow$	$\boxdotRight$	$\square \Rightarrow \circlearrowright$	$\circlearrowleft \square$	$\boxdotRight$	$\square \Rightarrow \diamond$	$\circlearrowright$	$\square \Rightarrow \diamond$	$\circlearrowleft$	$\square \Rightarrow \diamond$	$\Diamondright$
$\Leftarrow \square$	$\boxLeft$	$\Rightarrow \diamond$	$\diamond \Leftarrow \square$	$\boxLeft$	$\Leftarrow \diamond$	$\DiamonddotLeft$	$\Rightarrow \diamond$	$\DiamonddotLeft$	$\Leftarrow \diamond$	$\nearrow$
$\Leftarrow \square$	$\boxleft$	$\Rightarrow \diamond$	$\diamond \Leftarrow \square$	$\boxleft$	$\Leftarrow \diamond$	$\DiamonddotLeft$	$\Rightarrow \diamond$	$\DiamonddotLeft$	$\Leftarrow \diamond$	$\nwarrow$
$\square \Rightarrow$	$\boxright$	$\diamond \Rightarrow \square$	$\square \Rightarrow \diamond$	$\boxright$	$\diamond \Rightarrow \square$	$\DiamonddotRight$	$\Rightarrow \square$	$\DiamonddotRight$	$\diamond \Rightarrow \square$	$\rightarrow$
$\square \Rightarrow$	$\boxRight$	$\diamond \Rightarrow \square$	$\square \Rightarrow \diamond$	$\boxRight$	$\diamond \Rightarrow \square$	$\DiamonddotRight$	$\Rightarrow \square$	$\DiamonddotRight$	$\diamond \Rightarrow \square$	$\searrow$
$\Leftarrow \square$	$\circleddotleft$	$\Rightarrow \diamond$	$\diamond \Leftarrow \square$	$\circleddotleft$	$\Leftarrow \diamond$	$\DiamondLeft$	$\Rightarrow \diamond$	$\DiamondLeft$	$\Leftarrow \diamond$	$\swarrow$

TABLE 110: mathabx Arrows

$\circlearrowleft$	$\circlearrowleft$	$\leftarrow$	$\leftarrow$	$\nwarrow$
$\circlearrowright$	$\circlearrowright$	$\leftarrow\leftarrow$	$\leftarrow\leftarrow$	$\restriction$
$\curvearrowbotleft$	$\curvearrowbotleft$	$\leftrightarrow$	$\leftarrow\rightarrow$	$\rightarrow$
$\curvearrowbotleftright$	$\curvearrowbotleftright$	$\Leftarrow\Rightarrow$	$\leftarrow\rightarrow$	$\rightleftarrows$
$\curvearrowbotright$	$\curvearrowbotright$	$\Leftarrow\Rightarrow$	$\leftarrow\rightarrow$	$\rightleftarrows$
$\curvearrowleft$	$\curvearrowleft$	$\Leftarrow\Rightarrow$	$\leftarrow\rightarrow$	$\rightsquigarrow$
$\curvearrowleftright$	$\curvearrowleftright$	$\Leftarrow\Rightarrow$	$\leftarrow\rightarrow$	$\leftarrow\rightarrow$
$\curvearrowleft$	$\curvearrowleft$	$\Leftarrow\Rightarrow$	$\leftarrow\rightarrow$	$\rightsquigarrow$
$\curvearrowleftright$	$\curvearrowleftright$	$\Leftarrow\Rightarrow$	$\leftarrow\rightarrow$	$\leftarrow\rightarrow$
$\curvearrowright$	$\curvearrowright$	$\Leftarrow\Rightarrow$	$\leftarrow\rightarrow$	$\Rsh$
$\dsh$	$\dsh$	$\Downarrow\Downarrow$	$\Downarrow\Downarrow$	$\searrow$
$\downdownarrows$	$\downdownarrows$	$\Downarrow\Downarrow$	$\Downarrow\Downarrow$	$\swarrow$
$\downtouparrow$	$\downtouparrow$	$\Downarrow\Downarrow$	$\Downarrow\Downarrow$	$\updownarrows$
$\downuparrows$	$\downuparrows$	$\Downarrow\Downarrow$	$\Downarrow\Downarrow$	$\upuparrows$
$\drsh$	$\drsh$	$\nearrow$	$\nearrow$	$\upuparrows$

TABLE 111: mathabx Negated Arrows

$\Leftarrow \nLeftarrow$	$\Leftarrow \nLeftarrow$	$\Rightarrow \nrightarrow$	$\Rightarrow \nrightarrow$
$\Leftarrow \nLeftarrow$	$\Leftarrow \nLeftarrow$	$\Rightarrow \nrightarrow$	$\Rightarrow \nrightarrow$

TABLE 112: mathabx Harpoons

$\Leftarrow \barleftharpoon$	$\Leftarrow \leftharpoonup$	$\Rightarrow \rightleftharpoons$	$\rightleftharpoons$
$\Rightarrow \barrightharpoon$	$\Leftarrow \leftleftharpoons$	$\Rightarrow \rightrightharpoons$	$\rightrightharpoons$
$\Downarrow \downdownharpoons$	$\Leftarrow \leftrightharpoonup$	$\Downarrow \updownharpoons$	$\updownharpoons$
$\Downarrow \downharpoonleft$	$\Leftarrow \leftrightharpoons$	$\Downarrow \upharpoonleft$	$\upharpoonleft$
$\Downarrow \downharpoonright$	$\Rightarrow \rightbarharpoon$	$\Downarrow \upharpoonright$	$\upharpoonright$
$\Downarrow \downupharpoons$	$\Rightarrow \rightharpoondown$	$\Downarrow \upupharpoons$	$\upupharpoons$
$\Leftarrow \leftbarharpoon$	$\Rightarrow \rightharpoonup$		
$\Leftarrow \leftleftharpoon$	$\Rightarrow \rightleftharpoon$		

TABLE 113: MnSymbol Arrows

\curvearrowdownup	\longleftarrow	\longleftarrow	\rhookswarrow
\curvearrowleftright	\iff	\Longleftarrow	\rhookuparrow
\curvearrownesw	\leftrightarrow	\longleftrightarrow	\rightarrow
\curvearrownwse	\iff	\Longleftrightarrow	\Rightarrow
\curvearrowrightleft	\Longrightarrow	\longmapsto	\rightarrowtail
\curvearrowsenw	\longrightarrow	\longrightarrow	\rightleftarrows
\curvearrowswne	\Longrightarrow	\Longrightarrow	\rightlsquigarrow
\curvearrowupdown	\lozenge	\looparrowleft	\rightmapsto
\dasheddownarrow	\dagger	\looparrowright	\rightrightarrows
\dashedleftarrow	\dagger	\Lsh	\rightrsquigarrow
\dashednearrow	\nearrow		\Rightarrow
\dashednarrow	\nearrow		\Rsh
\dashedrightarrow	\nearrowtail		\searrow
\dashedsearrow	\nearrowtail		\Searrow
\dashedswarrow	\nearrowtail		\searrowtail
\dasheduparrow	\nearrowtail		\selsquigarrow
\Downarrow	\nearrowtail		\semapsto
\downarrow	\nearrowtail		\senarrows
\downarrowtail	\nearrowtail		\sersquigarrow
\downdownarrows	\nearrowtail		\sesearrows
\downlsquigarrow	\nearrowtail		\squigarrowdownup
\downmapsto	\nearrowtail		\squigarrowleftright
\downrsquigarrow	\nearrowtail		\squigarrownesw
\downuparrows	\nearrowtail		\squigarrownwse
\lcirclearrowdown	\nwmapsto		\squigarrowrightleft
\lcirclearrowleft	\nwnwarrows		\squigarrowsenw
\lcirclearrowright	\nwrsquigarrow		\squigarrowswne
\lcirclearrowup	\nwsearrow		\squigarrowupdown
\lcurvearrowdown	\nwsearrow		\swarrow
\lcurvearrowleft	\nwsearrows		\Sarrow
\lcurvearrowme	\partialartialvardlcircleleftint*		\swarrowtail
\lcurvearrownw	\partialartialvardlcirclerightint*		\swlsquigarrow
\lcurvearrowright	\partialartialvardrcircleleftint*		\swmapsto
\lcurvearrowse	\partialartialvardrcirclerightint*		\swnearrows
\lcurvearrowsw	\partialartialvarlccircleleftint*		\swrsquigarrow
\lcurvearrowup	\partialartialvarlccirclerightint*		\swswallows
\Leftarrow	\partialartialvartrccircleleftint*		\twoheaddownarrow
\leftarrow	\partialartialvartrccirclerightint*		\twoheadleftarrow
\leftarrowtail	\rcirclearrowdown		\twoheadnearrow
\leftleftarrows	\rcirclearrowleft		\twoheadnarrow
\leftlsquigarrow	\rcirclearrowright		\twoheadrightarrow
\leftmapsto	\rcirclearrowup		\twoheadsearrow
\leftrightarrow	\rcurvearrowdown		\twoheadswarrow
\Leftrightarrow	\rcurvearrowleft		\twoheaduparrow
\leftrightarrows	\rcurvearrowne		\uparrow
\leftrsquigarrow	\rcurvearrownw		\Uparrow
\lhookdownarrow	\rcurvearrowright		\uparrowtail

(continued on next page)

(continued from previous page)

$\leftarrow$	<code>\lhookleftarrow</code>	$\curvearrowleft$	<code>\rcurvaturese</code>	$\updownarrow$	<code>\updownarrow</code>
$\nearrow$	<code>\lhooknearrow</code>	$\curvearrownw$	<code>\rcurvaturesw</code>	$\Downarrow$	<code>\Updownarrow</code>
$\nwarrow$	<code>\lhooknarrow</code>	$\curvearroww$	<code>\rcurvatureup</code>	$\Updownarrow$	<code>\updownarrows</code>
$\rightarrow$	<code>\lhookrightarrow</code>	$\curvearrowd$	<code>\rhookdownarrow</code>	$\Downarrow$	<code>\uplsquigarrow</code>
$\searrow$	<code>\lhooksearrow</code>	$\curvearrowl$	<code>\rhookleftarrow</code>	$\uparrow$	<code>\upmapsto</code>
$\swarrow$	<code>\lhookswarrow</code>	$\curvearrowr$	<code>\rhooknearrow</code>	$\uparrow$	<code>\uprsquigarrow</code>
$\uparrow$	<code>\lhookuparrow</code>	$\curvearrowu$	<code>\rhooknarrow</code>	$\Updownarrow$	<code>\upuparrows</code>
$\nwarrow$	<code>\lightning</code>	$\curvearrowr$	<code>\rhookrightarrow</code>		
$\Leftarrow$	<code>\Lleftarrow</code>	$\curvearrowd$	<code>\rhooksearrow</code>		

MnSymbol additionally defines synonyms for some of the preceding symbols:

$\circlearrowleft$	<code>\circlearrowleft</code>	(same as <code>\rcirclearrowup</code> )
$\circlearrowright$	<code>\circlearrowright</code>	(same as <code>\lcirclearrowup</code> )
$\curvearrowleft$	<code>\curvearrowleft</code>	(same as <code>\rcurvatureleft</code> )
$\curvearrowright$	<code>\curvearrowright</code>	(same as <code>\lcurvatureright</code> )
$\dashleftarrow$	<code>\dashleftarrow</code>	(same as <code>\dashedleftarrow</code> )
$\dashrightarrow$	<code>\dashrightarrow</code>	(same as <code>\dashedrightarrow</code> )
$\hookleftarrow$	<code>\hookleftarrow</code>	(same as <code>\rhookleftarrow</code> )
$\hookrightarrow$	<code>\hookrightarrow</code>	(same as <code>\lhookrightarrow</code> )
$\leadsto$	<code>\leadsto</code>	(same as <code>\rightlsquigarrow</code> )
$\leftrightsquigarrow$	<code>\leftrightsquigarrow</code>	(same as <code>\squigarrowleftright</code> )
$\mapsto$	<code>\mapsto</code>	(same as <code>\rightmapsto</code> )
$\rightsquigarrow$	<code>\rightsquigarrow</code>	(same as <code>\rightlsquigarrow</code> )

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

TABLE 114: MnSymbol Negated Arrows

$\not\curvearrowdownup$	<code>\ncurvaturedownup</code>	$\not\curvearrowleftright$	<code>\ncurvatureleftright</code>	$\not\curvearrownwesw$	<code>\ncurvaturenwesw</code>	$\not\curvearrownwse$	<code>\ncurvaturenwse</code>	$\not\curvearrowrightleft$	<code>\ncurvaturerightleft</code>	$\not\curvearrowsenw$	<code>\ncurvaturesenw</code>	$\not\curvearrowswne$	<code>\ncurvatureswne</code>	$\not\curvearrowupdown$	<code>\ncurvatureupdown</code>	$\not\dasheddownarrow$	<code>\dasheddownarrow</code>	$\not\dashedleftarrow$	<code>\dashedleftarrow</code>	$\not\dashednearrow$	<code>\dashednearrow</code>	$\not\dashednarrow$	<code>\dashednarrow</code>	$\not\dashedrightarrow$	<code>\dashedrightarrow</code>	$\not\dashedsearrow$	<code>\dashedsearrow</code>
$\not\curvearrowleft$	<code>\lhookleftarrow</code>	$\not\curvearrowright$	<code>\rhookrightarrow</code>	$\not\curvearrownw$	<code>\lhooknarrow</code>	$\not\curvearrowr$	<code>\rhookswarrow</code>	$\not\curvearrowd$	<code>\lhookuparrow</code>	$\not\curvearrowl$	<code>\rhookleftarrow</code>	$\not\curvearrowu$	<code>\rhooknarrow</code>	$\not\curvearrowr$	<code>\rhookrightarrow</code>	$\not\curvearrowu$	<code>\lhooksearrow</code>	$\not\curvearrowr$	<code>\rhooksearrow</code>	$\not\curvearrowd$	<code>\rhooknarrow</code>	$\not\curvearrowl$	<code>\rhookleftarrow</code>	$\not\curvearrowu$	<code>\rhookrightarrow</code>	$\not\curvearrowd$	<code>\lhooksearrow</code>
$\not\curvearrowup$	<code>\rcurvaturese</code>	$\not\curvearrowsw$	<code>\rcurvaturesw</code>	$\not\curvearrowup$	<code>\rcurvatureup</code>	$\not\curvearrowu$	<code>\rhookdownarrow</code>	$\not\curvearrowd$	<code>\rhookuparrow</code>	$\not\curvearrowl$	<code>\rhookleftarrow</code>	$\not\curvearrowu$	<code>\rhooknarrow</code>	$\not\curvearrowr$	<code>\rhookrightarrow</code>	$\not\curvearrowu$	<code>\lhooksearrow</code>	$\not\curvearrowr$	<code>\rhooksearrow</code>	$\not\curvearrowd$	<code>\rhooknarrow</code>	$\not\curvearrowl$	<code>\rhookleftarrow</code>	$\not\curvearrowu$	<code>\rhookrightarrow</code>	$\not\curvearrowd$	<code>\lhooksearrow</code>
$\not\updownarrow$	<code>\updownarrow</code>	$\not\Updownarrow$	<code>\Updownarrow</code>	$\not\updownarrows$	<code>\updownarrows</code>	$\not\upmapsto$	<code>\upmapsto</code>	$\not\uprsquigarrow$	<code>\uprsquigarrow</code>	$\not\upuparrows$	<code>\upuparrows</code>																

(continued on next page)

(continued from previous page)

$\nwarrow$	<code>\ndashedswarrow</code>	$\nearrow$	<code>\nneswarrows</code>	$\nwarrow$	<code>\nsquigarrownwse</code>
$\uparrow$	<code>\ndasheduparrow</code>	$\nwarrow$	<code>\nNwarrows</code>	$\nwarrow$	<code>\nsquigarrownwesw</code>
$\downarrow$	<code>\ndownarrow</code>	$\nwarrow$	<code>\nnwarrows</code>	$\nwarrow$	<code>\nsquigarrownwne</code>
$\Downarrow$	<code>\nDownarrow</code>	$\nwarrow$	<code>\nnarrowtail</code>	$\nwarrow$	<code>\nsquigarrownrightleft</code>
$\Downarrow$	<code>\ndownarrowtail</code>	$\nwarrow$	<code>\nnwlsquigarrow</code>	$\nwarrow$	<code>\nsquigarrowsenw</code>
$\Downarrow$	<code>\ndowndownarrows</code>	$\nwarrow$	<code>\nnwmapsto</code>	$\nwarrow$	<code>\nsquigarrowswne</code>
$\Downarrow$	<code>\ndownlsquigarrow</code>	$\nwarrow$	<code>\nnwnwarrows</code>	$\nwarrow$	<code>\nsquigarrowsupdown</code>
$\Downarrow$	<code>\ndownmapsto</code>	$\nwarrow$	<code>\nnwrsquigarrow</code>	$\nwarrow$	<code>\nswarrow</code>
$\Downarrow$	<code>\ndownrsquigarrow</code>	$\nwarrow$	<code>\nnwsearrow</code>	$\nwarrow$	<code>\nSwarrow</code>
$\Downarrow$	<code>\downuparrows</code>	$\nwarrow$	<code>\nNwsearrow</code>	$\nwarrow$	<code>\nswarrowtail</code>
$\Downarrow$	<code>\nlcirclearrowdown</code>	$\nwarrow$	<code>\nnwsearrows</code>	$\nwarrow$	<code>\nswlsquigarrow</code>
$\Downarrow$	<code>\nlcirclearrowleft</code>	$\nwarrow$	<code>\nrcirclearrowdown</code>	$\nwarrow$	<code>\nswmapsto</code>
$\Downarrow$	<code>\nlcirclearrowright</code>	$\nwarrow$	<code>\nrcirclearrowleft</code>	$\nwarrow$	<code>\nswnearrows</code>
$\Downarrow$	<code>\nlcirclearrowup</code>	$\nwarrow$	<code>\nrcirclearrowright</code>	$\nwarrow$	<code>\nswrsquigarrow</code>
$\Downarrow$	<code>\nlcurvearrowdown</code>	$\nwarrow$	<code>\nrcircarrowup</code>	$\nwarrow$	<code>\nswswarrows</code>
$\Downarrow$	<code>\nlcurvearrowleft</code>	$\nwarrow$	<code>\nrcurvearrowdown</code>	$\nwarrow$	<code>\ntwoheaddownarrow</code>
$\nwarrow$	<code>\nlcurvearrowne</code>	$\nwarrow$	<code>\nrcurvearrowleft</code>	$\nwarrow$	<code>\ntwoheadleftarrow</code>
$\nwarrow$	<code>\nlcurvearrownw</code>	$\nwarrow$	<code>\nrcurvearrowne</code>	$\nwarrow$	<code>\ntwoheadnearrow</code>
$\nwarrow$	<code>\nlcurvearrowright</code>	$\nwarrow$	<code>\nrcurvearrownw</code>	$\nwarrow$	<code>\ntwoheadnarrow</code>
$\nwarrow$	<code>\nlcurvearrowse</code>	$\nwarrow$	<code>\nrcurvearrowright</code>	$\nwarrow$	<code>\ntwoheadrightarrow</code>
$\nwarrow$	<code>\nlcurvearrowsw</code>	$\nwarrow$	<code>\nrcurvearrowse</code>	$\nwarrow$	<code>\ntwoheadsearrow</code>
$\nwarrow$	<code>\nlcurvearrowup</code>	$\nwarrow$	<code>\nrcurvearrowsw</code>	$\nwarrow$	<code>\ntwoheadswarrow</code>
$\nwarrow$	<code>\nLeftarrow</code>	$\nwarrow$	<code>\nrcurvearrowup</code>	$\nwarrow$	<code>\ntwoheaduparrow</code>
$\nwarrow$	<code>\leftarrow</code>	$\nwarrow$	<code>\nrhookdownarrow</code>	$\nwarrow$	<code>\nuparrow</code>
$\nwarrow$	<code>\leftarrowtail</code>	$\nwarrow$	<code>\nrhookleftarrow</code>	$\nwarrow$	<code>\nUparrow</code>
$\nwarrow$	<code>\leftleftarrows</code>	$\nwarrow$	<code>\nrhooknearrow</code>	$\nwarrow$	<code>\nuparrowtail</code>
$\nwarrow$	<code>\leftleftarrow</code>	$\nwarrow$	<code>\nrhooknarrow</code>	$\nwarrow$	<code>\nupdownarrow</code>
$\nwarrow$	<code>\leftmapsto</code>	$\nwarrow$	<code>\nrhookrightarrow</code>	$\nwarrow$	<code>\nUpdownarrow</code>
$\nwarrow$	<code>\leftrightarrow</code>	$\nwarrow$	<code>\nrhooksearrow</code>	$\nwarrow$	<code>\nupdownarrows</code>
$\nwarrow$	<code>\leftrightarrowtail</code>	$\nwarrow$	<code>\nrhookswarrow</code>	$\nwarrow$	<code>\nuplsquigarrow</code>
$\nwarrow$	<code>\leftrightsquigarrow</code>	$\nwarrow$	<code>\nrhookuparrow</code>	$\nwarrow$	<code>\nupmapsto</code>
$\nwarrow$	<code>\nlhookdownarrow</code>	$\nwarrow$	<code>\nrightarrow</code>	$\nwarrow$	<code>\nuprsquigarrow</code>
$\nwarrow$	<code>\nlhookleftarrow</code>	$\nwarrow$	<code>\nrightarrowtail</code>	$\nwarrow$	<code>\nupuparrows</code>
$\nwarrow$	<code>\nlhooknearrow</code>	$\nwarrow$			

MnSymbol additionally defines synonyms for some of the preceding symbols:

$\circlearrowleft$	<code>\ncirclearrowleft</code>	(same as <code>\nrcirclearrowup</code> )
$\circlearrowright$	<code>\ncirclearrowright</code>	(same as <code>\nlcirclearrowup</code> )
$\curvearrowleft$	<code>\curvearrowleft</code>	(same as <code>\nrcurvearrowleft</code> )
$\curvearrowright$	<code>\curvearrowright</code>	(same as <code>\nlcurvearrowright</code> )
$\dasharrow$	<code>\ndasharrow</code>	(same as <code>\ndashedrightarrow</code> )
$\dashleftarrow$	<code>\dashleftarrow</code>	(same as <code>\dashedleftarrow</code> )
$\dashrightarrow$	<code>\dashrightarrow</code>	(same as <code>\dashedrightarrow</code> )
$\leftarrow$	<code>\ngots</code>	(same as <code>\nleftarrow</code> )
$\leftarrow$	<code>\nhookleftarrow</code>	(same as <code>\nrhookleftarrow</code> )
$\leftarrow$	<code>\nhookrightarrow</code>	(same as <code>\nlhookrightarrow</code> )
$\rightarrow$	<code>\nleadsto</code>	(same as <code>\nrightarrow</code> )
$\leftrightarrow$	<code>\nleftrightsquigarrow</code>	(same as <code>\nsquigarrowleftright</code> )
$\mapsto$	<code>\nmapsto</code>	(same as <code>\nrightarrowmapsto</code> )
$\rightsquigarrow$	<code>\nrightsquigarrow</code>	(same as <code>\nrightarrow</code> )
$\rightarrow$	<code>\nto</code>	(same as <code>\nrightarrow</code> )

TABLE 115: MnSymbol Harpoons

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

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

TABLE 116: MnSymbol Negated Harpoons

$\dagger$	<code>\ndownharpoonccw*</code>	$\ddagger$	<code>\nneswharpoons</code>	$\ddagger$	<code>\nseharpooncw</code>
$\dagger$	<code>\ndownharpooncw*</code>	$\ddagger$	<code>\nneswharpoonsenw</code>	$\ddagger$	<code>\nsenwharpoons</code>
$\ddagger$	<code>\downupharpoons</code>	$\ddagger$	<code>\nnwharpoonccw</code>	$\ddagger$	<code>\nswharpoonccw</code>
$\ddagger$	<code>\leftharpoonccw*</code>	$\ddagger$	<code>\nnwharpooncw</code>	$\ddagger$	<code>\nswharpooncw</code>
$\ddagger$	<code>\leftharpooncw*</code>	$\ddagger$	<code>\nnwseharpoonnesw</code>	$\ddagger$	<code>\nswneharpoons</code>
$\ddagger$	<code>\leftrightharpoondownup</code>	$\ddagger$	<code>\nnwseharpoons</code>	$\ddagger$	<code>\nupdownharpoonleftright</code>
$\ddagger$	<code>\leftrightharpoons</code>	$\ddagger$	<code>\nnwseharpoonsne</code>	$\ddagger$	<code>\nupdownharpoonrightleft</code>
$\ddagger$	<code>\leftrightharpoonupdown</code>	$\ddagger$	<code>\nrightharpoonccw*</code>	$\ddagger$	<code>\nupdownharpoons</code>
$\times$	<code>\nneharpoonccw</code>	$\times$	<code>\nrightharpooncw*</code>	$\times$	<code>\nupharpoonccw*</code>
$\times$	<code>\nneharpooncw</code>	$\times$	<code>\rightleftharpoons</code>	$\times$	<code>\nupharpooncw*</code>
$\times$	<code>\nneswharpoonnwse</code>	$\times$	<code>\nseharpoonccw</code>		

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

TABLE 117: harpoon Extensible Harpoons

$\overleftarrow{abc}$	<code>\overleftharp{abc}</code>	$\overrightarrow{abc}$	<code>\overrightharpd{abc}</code>	$\underline{abc}$	<code>\underrightharp{abc}</code>
$\overleftarrow{abc}$	<code>\overleftharpd{abc}</code>	$\underline{abc}$	<code>\underleftharp{abc}</code>	$\overrightarrow{abc}$	<code>\underrightharpd{abc}</code>
$\overrightarrow{abc}$	<code>\overrightharp{abc}</code>	$\underline{\overrightarrow{abc}}$	<code>\underleftharpd{abc}</code>		

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

TABLE 118: chemarrow Arrows

$\rightarrow$  `\chemarrow`

TABLE 119: fge Arrows

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

TABLE 120: MnSymbol Spoons

$\downarrow$	<code>\downfilledspoon</code>	$\nwarrow$	<code>\nnespoon</code>	$\nwarrow$	<code>\nwfilledspoon</code>
$\downarrow$	<code>\downspoon</code>	$\nwarrow$	<code>\nnwfilledspoon</code>	$\nwarrow$	<code>\nwspoon</code>
$\leftarrow$	<code>\leftfilledspoon</code>	$\nwarrow$	<code>\nnwspoon</code>	$\rightarrow$	<code>\rightfilledspoon</code>
$\leftarrow$	<code>\leftspoon</code>	$\rightarrow$	<code>\nrightfilledspoon</code>	$\rightarrow$	<code>\rightspoon*</code>
$\downarrow$	<code>\downfilledspoon</code>	$\rightarrow$	<code>\nrightspoon*</code>	$\bullet$	<code>\sefilledspoon</code>
$\downarrow$	<code>\downspoon</code>	$\rightarrow$	<code>\nrightspoon</code>	$\circlearrowleft$	<code>\sespoon</code>
$\nearrow$	<code>\nefilledspoon</code>	$\rightarrow$	<code>\nsespoon</code>	$\nearrow$	<code>\swfilledspoon</code>
$\nearrow$	<code>\nespoon</code>	$\rightarrow$	<code>\nsfwfilledspoon</code>	$\nearrow$	<code>\swspoon</code>
$\leftarrow$	<code>\leftfilledspoon</code>	$\rightarrow$	<code>\nswwspoon</code>	$\uparrow$	<code>\upfilledspoon</code>
$\leftarrow$	<code>\leftspoon</code>	$\rightarrow$	<code>\nupfilledspoon</code>	$\uparrow$	<code>\upspoon</code>
$\nearrow$	<code>\nnefilledspoon</code>	$\rightarrow$	<code>\nupspoon</code>		

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

TABLE 121: MnSymbol Pitchforks

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

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

TABLE 122: MnSymbol Smiles and Frowns

$\approx$	<code>\doublefrown</code>	$\not\approx$	<code>\nsmileeq</code>	$\asymp$	<code>\smileeq</code>
$\approxeq$	<code>\doublefrowneq</code>	$\not\approxeq$	<code>\nsmileeqfrown</code>	$\asymp$	<code>\smileeqfrown</code>
$\asymp$	<code>\doublesmile</code>	$\not\asymp$	<code>\nsmilefrown</code>	$\asymp$	<code>\smilefrown</code>
$\asymp$	<code>\doublesmileeq</code>	$\not\asymp$	<code>\nsmilefrowneq</code>	$\asymp$	<code>\smilefrowneq</code>
$\approx$	<code>\leqfrown</code>	$\not\approx$	<code>\nsqdoublefrown</code>	$\approx$	<code>\sqdoublefrown</code>
$\approx$	<code>\eqsmile</code>	$\not\approx$	<code>\nsqdoublefrowneq</code>	$\approx$	<code>\sqdoublefrowneq</code>
$\sim$	<code>\frown</code>	$\not\sim$	<code>\nsqdoublesmile</code>	$\asymp$	<code>\sqdoublesmile</code>
$\approx$	<code>\frowneq</code>	$\not\approx$	<code>\nsqdoublesmileeq</code>	$\asymp$	<code>\sqdoublesmileeq</code>
$\approx$	<code>\frownqsmile</code>	$\not\approx$	<code>\nsqeqfrown</code>	$\asymp$	<code>\sqeqfrown</code>
$\circ$	<code>\frownsmile</code>	$\not\circ$	<code>\nsqeqlsmile</code>	$\circ$	<code>\sqeqsmile</code>
$\circ$	<code>\frownsmileeq</code>	$\not\circ$	<code>\nsqfrown</code>	$\wedge$	<code>\sqfrown</code>
$\not\approx$	<code>\ndoublefrown</code>	$\not\approx$	<code>\nsqfrowneq</code>	$\triangleleft$	<code>\sqfrowneq</code>
$\not\approx$	<code>\ndoublefrowneq</code>	$\not\approx$	<code>\nsqfrowneqsmile</code>	$\triangleleft$	<code>\sqfrowneqsmile</code>
$\not\approx$	<code>\ndoublesmile</code>	$\not\approx$	<code>\nsqfrownsmile</code>	$\triangleleft$	<code>\sqfrownsmile</code>
$\not\approx$	<code>\ndoublesmileeq</code>	$\not\approx$	<code>\nsqsmile</code>	$\vee$	<code>\sqsmile</code>
$\not\approx$	<code>\neqfrown</code>	$\not\approx$	<code>\nsqsmileeq</code>	$\asymp$	<code>\sqsmileeq</code>
$\not\approx$	<code>\neqsmile</code>	$\not\approx$	<code>\nsqsmileeqfrown</code>	$\asymp$	<code>\sqsmileeqfrown</code>
$\not\approx$	<code>\nfrown</code>	$\not\approx$	<code>\nsqsmilefrown</code>	$\asymp$	<code>\sqsmilefrown</code>
$\not\approx$	<code>\nfrowneq</code>	$\not\approx$	<code>\nsqtriplefrown</code>	$\asymp$	<code>\sqtriplefrown</code>
$\not\approx$	<code>\nfrownqsmile</code>	$\not\approx$	<code>\nsqtriplesmile</code>	$\asymp$	<code>\sqtriplesmile</code>
$\not\approx$	<code>\nfrownsmile</code>	$\not\approx$	<code>\ntriplefrown</code>	$\asymp$	<code>\triplefrown</code>
$\not\approx$	<code>\nfrownsmileeq</code>	$\not\approx$	<code>\ntriplesmile</code>	$\asymp$	<code>\triplesmile</code>
$\circ$	<code>\nsmile</code>	$\circ$	<code>\smile</code>		

\* 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: uſy Contradiction Symbols

$\not\neg$  `\blitza`    $\not\neg$  `\blitzb`    $\not\neg$  `\blitzc`    $\not\neg$  `\blitzd`    $\not\neg$  `\blitze`

TABLE 124: Extension Characters

$\bar{}$  `\relbar` = `\Relbar`

TABLE 125: stmaryrd Extension Characters

$\not\rightarrow$  `\Arrownnot` + `\Mapsfromchar` + `\Mapstochar`  
 $\not\rightarrow$  `\arrownot` + `\mapsfromchar`

TABLE 126: txfonts/pxfonts Extension Characters

$\not\rightarrow$  `\Mappedfromchar` # `\Mmappedfromchar` # `\Mmapstochar`  
 $\not\rightarrow$  `\mappedfromchar` # `\mmappedfromchar` # `\ mmapstochar`

TABLE 127: *mathabx* Extension Characters

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

TABLE 128: Log-like Symbols

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

Calling the above “symbols” may be a bit misleading.<sup>3</sup> Each log-like symbol merely produces the eponymous textual equivalent, but with proper surrounding spacing. See Section 8.4 for more information about log-like symbols. As `\bmod` and `\pmod` are arguably not symbols we refer the reader to the Short Math Guide for L<sup>A</sup>T<sub>E</sub>X [Dow00] for samples.

TABLE 129: *AMStex* Log-like Symbols

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

Load the **amsmath** package to get these symbols. See Section 8.4 for some additional comments regarding log-like symbols. As `\mod` and `\pod` are arguably not symbols we refer the reader to the Short Math Guide for L<sup>A</sup>T<sub>E</sub>X [Dow00] for samples.

TABLE 130: QfA2e Number Sets

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

---

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

TABLE 131: Greek Letters

$\alpha$	<code>\alpha</code>	$\theta$	<code>\theta</code>	$\circ$	<code>\circ</code>	$\tau$	<code>\tau</code>
$\beta$	<code>\beta</code>	$\vartheta$	<code>\vartheta</code>	$\pi$	<code>\pi</code>	$\upsilon$	<code>\upsilon</code>
$\gamma$	<code>\gamma</code>	$\iota$	<code>\iota</code>	$\varpi$	<code>\varpi</code>	$\phi$	<code>\phi</code>
$\delta$	<code>\delta</code>	$\kappa$	<code>\kappa</code>	$\rho$	<code>\rho</code>	$\varphi$	<code>\varphi</code>
$\epsilon$	<code>\epsilon</code>	$\lambda$	<code>\lambda</code>	$\varrho$	<code>\varrho</code>	$\chi$	<code>\chi</code>
$\varepsilon$	<code>\varepsilon</code>	$\mu$	<code>\mu</code>	$\sigma$	<code>\sigma</code>	$\psi$	<code>\psi</code>
$\zeta$	<code>\zeta</code>	$\nu$	<code>\nu</code>	$\varsigma$	<code>\varsigma</code>	$\omega$	<code>\omega</code>
$\eta$	<code>\eta</code>	$\xi$	<code>\xi</code>				
$\Gamma$	<code>\Gamma</code>	$\Lambda$	<code>\Lambda</code>	$\Sigma$	<code>\Sigma</code>	$\Psi$	<code>\Psi</code>
$\Delta$	<code>\Delta</code>	$\Xi$	<code>\Xi</code>	$\Upsilon$	<code>\Upsilon</code>	$\Omega$	<code>\Omega</code>
$\Theta$	<code>\Theta</code>	$\Pi$	<code>\Pi</code>	$\Phi$	<code>\Phi</code>		

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

See Section 8.5 for examples of how to produce bold Greek letters.

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

TABLE 132: *AMS* Greek Letters

$F$     `\digamma`     $\varkappa$     `\varkappa`

TABLE 133: `txfonts/pxfonts` Upright Greek Letters

$\alpha$	<code>\alphaup</code>	$\theta$	<code>\thetaup</code>	$\pi$	<code>\piup</code>	$\phi$	<code>\phiup</code>
$\beta$	<code>\betaup</code>	$\vartheta$	<code>\varthetaup</code>	$\varpi$	<code>\varpiup</code>	$\varphi$	<code>\varphiup</code>
$\gamma$	<code>\gammaup</code>	$\iota$	<code>\iotaup</code>	$\rho$	<code>\rhoup</code>	$\chi$	<code>\chiup</code>
$\delta$	<code>\deltaup</code>	$\kappa$	<code>\kappaup</code>	$\varrho$	<code>\varrhoup</code>	$\psi$	<code>\psiup</code>
$\epsilon$	<code>\epsilonup</code>	$\lambda$	<code>\lambdaup</code>	$\sigma$	<code>\sigmaup</code>	$\omega$	<code>\omegaup</code>
$\varepsilon$	<code>\varepsilonup</code>	$\mu$	<code>\muup</code>	$\varsigma$	<code>\varsigmaup</code>		
$\zeta$	<code>\zetaup</code>	$\nu$	<code>\nuup</code>	$\tau$	<code>\tauup</code>		
$\eta$	<code>\etaup</code>	$\xi$	<code>\xiup</code>	$\upsilon$	<code>\upsilonup</code>		

TABLE 134: `upgreek` Upright Greek Letters

$\alpha$	<code>\upalpha</code>	$\theta$	<code>\uptheta</code>	$\pi$	<code>\uppi</code>	$\phi$	<code>\upphi</code>
$\beta$	<code>\upbeta</code>	$\vartheta$	<code>\upvartheta</code>	$\varpi$	<code>\upvarpi</code>	$\varphi$	<code>\upvarphi</code>
$\gamma$	<code>\upgamma</code>	$\iota$	<code>\upiota</code>	$\rho$	<code>\uprho</code>	$\chi$	<code>\upchi</code>
$\delta$	<code>\updelta</code>	$\kappa$	<code>\upkappa</code>	$\wp$	<code>\upvarrho</code>	$\psi$	<code>\uppsi</code>
$\epsilon$	<code>\upepsilon</code>	$\lambda$	<code>\uplambda</code>	$\sigma$	<code>\upsigma</code>	$\omega$	<code>\upomega</code>
$\varepsilon$	<code>\upvarepsilon</code>	$\mu$	<code>\upmu</code>	$\varsigma$	<code>\upvarsigma</code>		
$\zeta$	<code>\upzeta</code>	$\nu$	<code>\upnu</code>	$\tau$	<code>\uptau</code>		
$\eta$	<code>\upeta</code>	$\xi$	<code>\upxi</code>	$\upsilon$	<code>\upupsilon</code>		
$\Gamma$	<code>\Upsilon</code>	$\Lambda$	<code>\Upsilon</code>	$\Sigma$	<code>\Upsilon</code>	$\Psi$	<code>\Upsilon</code>
$\Delta$	<code>\Updelta</code>	$\Xi$	<code>\Upxi</code>	$\Upsilon$	<code>\Upupsilon</code>	$\Omega$	<code>\Upomega</code>
$\Theta$	<code>\Upsilon</code>	$\Pi$	<code>\Upsilon</code>	$\Phi$	<code>\Upsilon</code>		

`upgreek` utilizes upright Greek characters from either the PostScript Symbol font (depicted above) or Euler Roman. As a result, the glyphs may appear slightly different from the above. Contrast, for example, “ $\Gamma\Delta\Theta\alpha\beta\gamma$ ” (Symbol) with “ $\Gamma\Delta\Theta\alpha\beta\gamma$ ” (Euler).

TABLE 135: `fourier` Variant Greek Letters

$\pi$	<code>\pi</code>	$\rho$	<code>\rho</code>
$\varpi$	<code>\varpi</code>	$\varrho$	<code>\varrho</code>
$\varvarpi$	<code>\varvarpi</code>	$\varvarrho$	<code>\varvarrho</code>

TABLE 136: `txfonts/pxfonts` Variant Latin Letters

$g$	<code>\varg</code>	$v$	<code>\varv</code>	$w$	<code>\varw</code>	$y$	<code>\vary</code>
-----	--------------------	-----	--------------------	-----	--------------------	-----	--------------------

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

TABLE 137: `AMS` Hebrew Letters

$\beth$	<code>\beth</code>	$\gimel$	<code>\gimel</code>	$\daleth$	<code>\daleth</code>
---------	--------------------	----------	---------------------	-----------	----------------------

`\aleph` ( $\aleph$ ) appears in Table 201 on page 73.

TABLE 138: `MnSymbol` Hebrew Letters

$\aleph$	<code>\aleph</code>	$\beth$	<code>\beth</code>	$\gimel$	<code>\gimel</code>	$\daleth$	<code>\daleth</code>
----------	---------------------	---------	--------------------	----------	---------------------	-----------	----------------------

TABLE 139: Letter-like Symbols

$\perp$	<code>\bot</code>	$\forall$	<code>\forallall</code>	$\imath$	<code>\imath</code>	$\ni$	<code>\ni</code>	$\top$	<code>\top</code>
$\ell$	<code>\ell</code>	$\hbar$	<code>\hbar</code>	$\in$	<code>\in</code>	$\partial$	<code>\partial</code>	$\wp$	<code>\wp</code>
$\exists$	<code>\exists</code>	$\Im$	<code>\Im</code>	$\jmath$	<code>\jmath</code>	$\Re$	<code>\Re</code>		

TABLE 140: *AMS* Letter-like Symbols

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

TABLE 141: txfonts/pffonts Letter-like Symbols

$\mathfrak{c}$	<code>\mathfrak{c}</code>	$\mathfrak{f}$	<code>\mathfrak{f}</code>	$\mathfrak{g}$	<code>\mathfrak{g}</code>	$\mathfrak{n}$	<code>\mathfrak{n}</code>	$\mathfrak{p}$	<code>\mathfrak{p}</code>
----------------	---------------------------	----------------	---------------------------	----------------	---------------------------	----------------	---------------------------	----------------	---------------------------

\* It's generally preferable to use the corresponding symbol from Table 3 on page 10 because the symbols in that table work properly in both text mode and math mode.

TABLE 142: mathabx Letter-like Symbols

$\bar{\in}$	<code>\barin</code>	$\in$	<code>\in</code>	$\not\top$	<code>\nottop</code>	$\notin$	<code>\varnotin</code>
$\complement$	<code>\complement</code>	$\not\exists$	<code>\notexists</code>	$\owns$	<code>\owns</code>	$\not\owns$	<code>\varnotowns</code>
$\exists$	<code>\exists</code>	$\not\bot$	<code>\notbot</code>	$\not\top$	<code>\nottop</code>	$\not\in$	<code>\varnotin</code>
$\not\exists$	<code>\not\exists</code>	$\not\in$	<code>\notin</code>	$\partial$	<code>\partial</code>	$\not\partial$	<code>\varnotpartial</code>
$\not\top$	<code>\nottop</code>	$\not\in$	<code>\notin</code>	$\not\partial$	<code>\notpartial</code>	$\not\partial$	<code>\varnotpartial</code>
$\not\in$	<code>\notin</code>	$\not\partial$	<code>\notpartial</code>	$\not\partial$	<code>\notpartial</code>	$\not\partial$	<code>\varnotpartial</code>
$\not\partial$	<code>\notpartial</code>	$\not\partial$	<code>\notpartial</code>	$\not\partial$	<code>\notpartial</code>	$\not\partial$	<code>\varnotpartial</code>
$\not\partial$	<code>\notpartial</code>	$\not\partial$	<code>\notpartial</code>	$\not\partial$	<code>\notpartial</code>	$\not\partial$	<code>\varnotpartial</code>

TABLE 143: MnSymbol Letter-like Symbols

$\perp$	<code>\bot</code>	$\epsilon$	<code>\in</code>	$\not\in$	<code>\notin</code>	$\top$	<code>\top</code>
$\exists$	<code>\exists</code>	$\not\exists$	<code>\notexists</code>	$\owns$	<code>\owns</code>	$\not\owns$	<code>\varnotowns</code>
$\forall$	<code>\forall</code>	$\not\in$	<code>\notin</code>	$\not\in$	<code>\notin</code>	$\wp$	<code>\wp</code>

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

TABLE 144: trfsigns Letter-like Symbols

$e$	<code>\e</code>	$j$	<code>\im</code>
-----	-----------------	-----	------------------

TABLE 145: `mathdesign` Letter-like Symbols

$\in$	<code>\in</code>	$\ni$	<code>\owns</code>
$\not\in$	<code>\notin</code>	$\smallsetminus$	<code>\smallsetminus</code>
$\not\subset$	<code>\not\subset</code>	$\smallsetminus\!\smallsetminus$	<code>\smallsetminus\!\smallsetminus</code>
$\not\models$	<code>\not\models</code>		

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

TABLE 146: `fge` Letter-like Symbols

$\mathbb{V}$	<code>\fgeA</code>	$\mathbb{g}$	<code>\fgeesett</code>	$\mathbb{B}$	<code>\fgeleftB</code>	$\mathbb{F}$	<code>\fgeU</code>
$\mathbb{d}$	<code>\fgec</code>	$\mathbb{H}$	<code>\fgeF</code>	$\mathbb{O}$	<code>\fgeleftC</code>		
$\mathbb{p}$	<code>\fged</code>	$\mathbb{J}$	<code>\fgef</code>	$\mathbb{B}$	<code>\fgerightB</code>		
$\mathbb{d}$	<code>\fgee</code>	$\mathbb{y}$	<code>\fgelb*</code>	$\mathbb{f}$	<code>\fges</code>		

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

TABLE 147: `fourier` Letter-like Symbols

$\partial$	<code>\partial</code>	$\partial$	<code>\partial</code>
		$\varpartial$	<code>\varpartial</code>

TABLE 148: `AMS` Delimiters

$\lceil$	<code>\ulcorner</code>	<math\rceil< math=""></math\rceil<>	<code>\urcorner</code>
$\lfloor$	<code>\llcorner</code>	<math\rfloor< math=""></math\rfloor<>	<code>\lrcorner</code>

TABLE 149: `stmaryrd` Delimiters

$\{$	<code>\Lbag</code>	$\}$	<code>\Rbag</code>	$\{$	<code>\lbag</code>	$\}$	<code>\rbag</code>
$\llbracket$	<code>\llceil</code>	$\rrbracket$	<code>\rrceil</code>	$\llbracket$	<code>\llfloor</code>	$\rrbracket$	<code>\rrfloor</code>
$($	<code>\llparenthesis</code>	$)$	<code>\rrparenthesis</code>				

TABLE 150: `mathabx` Delimiters

$\lceil$	<code>\lcorners</code>	<math\rceil< math=""></math\rceil<>	<code>\rcorners</code>
$\lceil$	<code>\ulcorner</code>	<math\rceil< math=""></math\rceil<>	<code>\urcorner</code>
$\lfloor$	<code>\llcorner</code>	<math\rfloor< math=""></math\rfloor<>	<code>\lrcorner</code>

TABLE 151: `nath` Delimiters

$\llcorner$	<code>\niv</code>	$\lrcorner$	<code>\vin</code>
-------------	-------------------	-------------	-------------------

TABLE 152: Variable-sized Delimiters

$\downarrow$	$\downarrow$	$\backslash\downarrowarrow$	$\Downarrow$	$\Downarrow$	$\left[ \quad \right]$	$\left[ \quad \right]$	$\left[ \quad \right]$	$\left[ \quad \right]$
$\langle$	$\langle$	$\backslash\langleangle$	$\rangle$	$\rangle$	$\backslash\rangleangle$	$ $	$ $	$\parallel$
$\lceil$	$\lceil$	$\backslash\lceilceil$	$\rceil$	$\rceil$	$\backslash\rceilceil$	$\uparrow$	$\uparrow$	$\uparrow$
$\lfloor$	$\lfloor$	$\backslash\lfloor\lfloor$	$\rfloor$	$\rfloor$	$\backslash\rfloor\rfloor$	$\updownarrow$	$\updownarrow$	$\updownarrow$
$($	$($	$\backslash($	$)$	$)$	$\backslash)$	$\{$	$\{$	$\}$
$/$	$/$	$/$	$\backslash$	$\backslash$	$\backslash$	$\backslash\backslash$		

When used with  $\left\langle\right\rangle$  and  $\left\langle\right\rangle$ , these symbols expand to the height of the enclosed math expression. Note that  $\left\langle\right\rangle$  is a synonym for  $\langle\rangle$ , and  $\left\langle\right\rangle$  is a synonym for  $\langle\rangle$ .

$\varepsilon$ -TEX provides a  $\left\langle\middle\langle\right\rangle\middle\rangle$  analogue to  $\left\langle\right\rangle$  and  $\left\langle\right\rangle$ .  $\left\langle\middle\langle\right\rangle\middle\rangle$  can be used, for example, to make an internal “|” expand to the height of the surrounding  $\left\langle\right\rangle$  and  $\left\langle\right\rangle$  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

$\left\{ \quad \right\}$	$\backslash\left\{ \quad \right\}$	$\left\langle \quad \right\rangle$	$\backslash\left\langle \quad \right\rangle$	$\left( \quad \right)$	$\backslash\left( \quad \right)$	$\left[ \quad \right]$	$\backslash\left[ \quad \right]$	$\left. \quad \right)$
$\left  \quad \right $	$\backslash\left  \quad \right $	$\left\langle\middle\langle \quad \right\rangle\middle\rangle$	$\backslash\left\langle\middle\langle \quad \right\rangle\middle\rangle$	$\left\langle\middle\langle \quad \right\rangle\middle\rangle$	$\backslash\left\langle\middle\langle \quad \right\rangle\middle\rangle$	$\left\langle\middle\langle \quad \right\rangle\middle\rangle$	$\backslash\left\langle\middle\langle \quad \right\rangle\middle\rangle$	$\left. \quad \right)$

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

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

$\left  \quad \right $	$\backslash\left  \quad \right $	$\left\langle\middle\langle \quad \right\rangle\middle\rangle$	$\backslash\left\langle\middle\langle \quad \right\rangle\middle\rangle$
$\left\  \quad \right\ $	$\backslash\left\  \quad \right\ $	$\left\langle\middle\langle \quad \right\rangle\middle\rangle$	$\backslash\left\langle\middle\langle \quad \right\rangle\middle\rangle$

According to the `amsmath` documentation [AMS99], the preceding symbols are intended to be used as delimiters (e.g., as in “ $|z|$ ”) while the  $\left\langle\right\rangle$  and  $\left\langle\right\rangle$  symbols (Table 152) are intended to be used as operators (e.g., as in “ $p|q$ ”).

TABLE 155: `stmaryrd` Variable-sized Delimiters
$$\llbracket \quad \backslash l1bracket \quad \rrbracket \quad \backslash rrbracket$$
TABLE 156: `mathabx` Variable-sized Delimiters
$$\begin{array}{ccc} \llbracket \quad \backslash ldbrack & \rrbracket \quad \backslash rdbrack \\ \langle \quad \backslash lfilet & \rangle \quad \backslash rfilet \\ | \quad \backslash thickvert & || \quad \backslash vvvert \end{array}$$
TABLE 157: `MnSymbol` Variable-sized Delimiters

[	$\left[ \quad \backslash lceil \quad \right]$	$\right] \quad \backslash rceil$	[	$\left[ \quad \backslash ulcorner \quad \right]$	$\right] \quad \backslash urcorner$
[	$\left[ \quad \backslash lfloor \quad \right]$	$\right] \quad \backslash rfloor$	[	$\left[ \quad \backslash llcorner \quad \right]$	$\right] \quad \backslash lrcorner$
{	$\left\{ \quad \backslash lwavey \quad \right\}$	$\right\} \quad \backslash rwavey$	{	$\left\{ \quad \backslash langle \quad \right\}$	$\right\} \quad \backslash rangle$
{	$\left\{ \quad \backslash lWavy \quad \right\}$	$\right\} \quad \backslash rWavy$	{	$\left\{ \quad \backslash langlebar \quad \right\}$	$\right\} \quad \backslash ranglebar$
(	$\left( \quad ( \quad ) \quad \right)$	$) \quad \backslash rgroup$	(	$\left( \quad \backslash lgroup \quad \right)$	$\right) \quad \backslash rgroup$
〔	$\left[ \quad \backslash lsem \quad \right]$	$\right] \quad \backslash rsem$	《	$\left\langle \quad \backslash llangle \quad \right\rangle$	$\right\rangle \quad \backslash rrangle$
{	$\left\{ \quad \backslash lmoustache \quad \right\}$	$\right\} \quad \backslash rmoustache$	{	$\left\{ \quad \backslash lbrace \quad \right\}$	$\right\} \quad \backslash rbrace$
/	$/ \quad /$	$\backslash \quad \backslash$	$\backslash \quad \backslash$	$\left\{ \quad < \quad \right\}$	$\right\} \quad >$

(continued on next page)

(continued from previous page)

[	$\left[ \quad \right]$	]	$\left[ \quad \right]$	$\left[ \quad \right]$	$\left[ \quad \right]$
	$\mid$	$\parallel$	$\mid$	$\mid$	$\mid$
	$\backslash\text{arrowvert}$	$\parallel$	$\mid$	$\mid$	$\backslash\text{Arrowvert}$

`\vert` is a synonym for `\mid`. `\Vert` is a synonym for `\parallel`. `\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

$\langle$	$\left\langle \quad \right\rangle$	<code>\leftwave</code>	$\rangle$	$\right\langle \quad \right\rangle$	<code>\rightwave</code>
$,$	$\left\langle \quad \right\rangle$	<code>\leftevaw</code>	$,$	$\right\langle \quad \right\rangle$	<code>\rightevaw</code>

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

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

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

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

All of the symbols in Table 159 can also be expressed using the `\double` macro. See the `nath` documentation for examples and additional information.

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

$\langle\langle\langle \backslash triple< \rangle\rangle\rangle$	<code>\triple&gt;</code>
$\llbracket \llbracket \llbracket \backslash triple[ \rrbracket \rrbracket \rrbracket$	<code>\triple]</code>
$\parallel \parallel \parallel \backslash ltriple ^{*}$	<code>\rtriple ^{*}</code>

\* Similar to `\lVert` and `\rVert` in Table 159, `\ltriple` and `\rtriple` must be used instead of `\triple` to disambiguate whether “ $|$ ” is a left or right delimiter.

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

TABLE 161: `fourier` Variable-sized Delimiters

$\llbracket \llbracket \backslash llbracket \rrbracket \rrbracket$	<code>\rrbracket</code>
$\llll \llll \backslash VERT$	

TABLE 162: `textcomp` Text-mode Delimiters

{	<code>\textlangle</code>	}	<code>\textrangle</code>
〔	<code>\textlbrackdbl</code>	〕	<code>\textrbrackdbl</code>
{	<code>\textlquill</code>	}	<code>\textrquill</code>

TABLE 163: `metre` Text-mode Delimiters

}	<code>\alad</code>	}	<code>\Alad</code>	†	<code>\crux</code>	†	<code>\Crux</code>
{	<code>\alas</code>	{	<code>\Alas</code>	〕	<code>\quadrad</code>	〕	<code>\Quadrad</code>
)	<code>\angud</code>	)	<code>\Angud</code>	〔	<code>\quadras</code>	〔	<code>\Quadas</code>
(	<code>\angus</code>	(	<code>\Angus</code>				

TABLE 164: Math-mode Accents

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

Also note the existence of `\imath` and `\jmath`, which produce dotless versions of “*i*” and “*j*”. (See Table 201 on page 73.) These are useful when the accent is supposed to replace the dot. For example, “`\hat{\imath}`” produces a correct “ $\hat{i}$ ”, while “`\hat{i}`” would yield the rather odd-looking “ $\hat{\hat{i}}$ ”.

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

$\ddot{a}$	<code>\ddot{a}</code>	$\dddot{a}$	<code>\dddot{a}</code>
------------	-----------------------	-------------	------------------------

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  $\mathcal{AM}$ S ones tighten the space between the dots (from  $\ddot{a}$  to  $\ddot{a}$ ). The `mathabx` and `mathdots` versions also function properly within subscripts and superscripts ( $x\ddot{a}$  instead of  $x\ddot{\ddot{a}}$ ).

TABLE 166: MnSymbol Math-mode Accents

$\vec{a}$	<code>\vec{a}</code>
-----------	----------------------

TABLE 167: fge Math-mode Accents

$\grave{A}\grave{a}$	<code>\spirituslenis{A}\spirituslenis{a}</code> *
----------------------	---

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

TABLE 168: *yhmath* Math-mode Accents

$\mathring{a}$  \mathring{a}

This symbol is largely obsolete, as standard L<sup>A</sup>T<sub>E</sub>X 2<sub>&</sub> has supported \mathring{a} 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 “ $3 + \cancel{2}$ ”) then consider using the `cancel` package.

‡ With an optional argument, `\sqrt[n]{abc}` 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: *AMS* Extensible Accents

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

TABLE 173: *MnSymbol* Extensible Accents

$\overbrace{\overbrace{abc}}$	<code>\overbrace{abc}</code>	$\underbrace{\underbrace{abc}}$	<code>\underbrace{abc}</code>
$\overbrace{\overbrace{abc}}$	<code>\overgroup{abc}</code>	$\underbrace{\underbrace{abc}}$	<code>\undergroup{abc}</code>
$\overline{\overline{abc}}$	<code>\overlinesegment{abc}</code>	$\underline{\underline{abc}}$	<code>\underlinesegment{abc}</code>
$\overbrace{\overbrace{abc}}$	<code>\overleftharpoon{abc}</code>	$\overbrace{\overbrace{abc}}$	<code>\overrightharpoon{abc}</code>
$\widehat{abc}$	<code>\widehat{abc}</code>	$\widetilde{abc}$	<code>\widetilde{abc}</code>
$\wideparen{abc}$	<code>\wideparen{abc}</code>		

TABLE 174: *mathtools* Extensible Accents

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

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

TABLE 175: *mathabx* Extensible Accents

$\overbrace{\overbrace{abc}}$	<code>\overbrace{abc}</code>	$\overline{abc}$	<code>\widebar{abc}</code>
$\overbrace{\overbrace{abc}}$	<code>\overgroup{abc}</code>	$\check{abc}$	<code>\widecheck{abc}</code>
$\underbrace{\underbrace{abc}}$	<code>\underbrace{abc}</code>	$\overline{abc}$	<code>\wideparen{abc}</code>
$\underbrace{\underbrace{abc}}$	<code>\undergroup{abc}</code>	$\overset{\circ}{abc}$	<code>\widering{abc}</code>
$\overrightarrow{abc}$	<code>\widearrow{abc}</code>		

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

TABLE 176: `fourier` Extensible Accents

$\widehat{abc}$	<code>\widearc{abc}</code>	$\widehat{abc}$	<code>\wideparen{abc}</code>
$\overbrace{abc}$	<code>\wideOarc{abc}</code>	$\overset{\circ}{abc}$	<code>\widering{abc}</code>

TABLE 177: `esvect` Extensible Accents

$\overrightarrow{abc}$	<code>\vv{abc}</code> with package option a
$\overrightarrow{abc}$	<code>\vv{abc}</code> with package option b
$\overrightarrow{abc}$	<code>\vv{abc}</code> with package option c
$\overrightarrow{abc}$	<code>\vv{abc}</code> with package option d
$\overrightarrow{abc}$	<code>\vv{abc}</code> with package option e
$\overrightarrow{abc}$	<code>\vv{abc}</code> with package option f
$\overrightarrow{abc}$	<code>\vv{abc}</code> with package option g
$\overrightarrow{abc}$	<code>\vv{abc}</code> with package option h

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

TABLE 178: `undertilde` Extensible Accents

$\underline{abc}$	<code>\utilde{abc}</code>
-------------------	---------------------------

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

TABLE 179: `ushort` Extensible Accents

$\underline{\underline{abc}}$	<code>\ushortdw{abc}</code>	$\underline{abc}$	<code>\ushortw{abc}</code>
-------------------------------	-----------------------------	-------------------	----------------------------

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

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

TABLE 180: `AMS` Extensible Arrows

$\longleftarrow^{abc}$	<code>\xleftarrow{abc}</code>	$\longrightarrow^{abc}$	<code>\xrightarrow{abc}</code>
------------------------	-------------------------------	-------------------------	--------------------------------

TABLE 181: `mathtools` Extensible Arrows

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

TABLE 182: `chemarr` Extensible Arrows

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

TABLE 183: `chemarrow` Extensible Arrows

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

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

TABLE 184: `extarrows` Extensible Arrows

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

TABLE 185: `extpfeil` Extensible Arrows

$\xlongequal{abc}$	<code>\xlongequal{abc}</code>	$\xmapsto{abc}$	<code>\xmapsto{abc}</code>
$\twoheadleftarrow{abc}$	<code>\twoheadleftarrow{abc}</code>	$\twoheadrightarrow{abc}$	<code>\twoheadrightarrow{abc}</code>

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

TABLE 186: `DotArrow` Extensible Arrows

$$\dot{\longrightarrow} \quad \text{\code{\dotarrow{a}}}$$

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

TABLE 187: `trfsigns` Extensible Transform Symbols

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

TABLE 188: `holtpolt` Non-commutative Division Symbols

$$\begin{array}{ccc} \overline{abc} & \text{\code{\holter{abc}{def}}} & \overline{abc} \\ \overline{def} & & \overline{def} \end{array} \quad \text{\code{\polter{abc}{def}}}$$

TABLE 189: Dots

$$\begin{array}{cccccc} \cdot & \text{\code{\cdotp}} & : & \text{\code{\colon*}} & . & \text{\code{\ldotp}} & \vdots & \text{\code{\vdots}} & \text{\code{\vdots}} & \text{\code{\vdots}} \\ \cdots & \text{\code{\cdots}} & & & \ddots & \text{\code{\ddots}} & & & \ldots & \text{\code{\ldots}} & \text{\code{\ldots}} \end{array}$$

\* While “:” is valid in math mode, `\colon` uses different surrounding spacing. See Section 8.4 and the Short Math Guide for L<sup>A</sup>T<sub>E</sub>X [Dow00] for more information on math-mode spacing.

† The `mathdots` package redefines `\ddots` and `\vdots` to make them scale properly with font size. (They normally scale horizontally but not vertically.) `\fixedddots` and `\fixedvdots` provide the original, fixed-height functionality of L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub>'s `\ddots` and `\vdots` macros.

TABLE 190: *AMS* Dots

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

\* `\because` and `\therefore` are defined as binary relations and therefore also appear in Table 68 on page 34.

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

TABLE 191: *wasysym* Dots

$\therefore$

`\wasytherefore`

TABLE 192: *MnSymbol* Dots

$\cdot$	<code>\cdot</code>	$\cdots$	<code>\hdotdot</code>	$\therefore$	<code>\udots</code>
$\therefore$	<code>\ddotdotdot</code>	$\cdots$	<code>\hdots</code>	$\therefore$	<code>\uptherefore</code>
$\therefore$	<code>\ddots</code>	$\therefore$	<code>\leftttherefore</code>	$\therefore$	<code>\vdotdot</code>
$\therefore$	<code>\diamonddotdotdot</code>	$\therefore$	<code>\rightttherefore</code>	$\therefore$	<code>\vdots</code>
$\therefore$	<code>\downttherefore</code>	$\therefore$	<code>\sqcdot</code>		
$\therefore$	<code>\fivedots</code>	$\therefore$	<code>\udotdot</code>		

*MnSymbol* defines `\therefore` as `\uptherefore` and `\because` as `\downttherefore`. 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 26. Also, unlike most of the other dot symbols in this document, *MnSymbol*'s dots are defined as single characters instead of as composites of multiple single-dot characters.

TABLE 193: *mathdots* Dots

$\cdots$

`\iddots`

TABLE 194: *yhmath* Dots

$\cdots$

`\adots`

TABLE 195: teubner Dots

```
: \: ; \; : \? :: \antilabe
```

TABLE 196: mathcomp Math Symbols

$^{\circ}\text{C}$	\tccentigrade	$\Omega$	\tcohm	$\%$	\tcpertousand
$\mu$	\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

```
\emptyset \fgestruckzero \{ \fgestruckone
```

TABLE 199: dozenal Base-12 Digits

```
\j \x \e \e
```

TABLE 200: mathabx Mayan Digits

\ding{110}	\maya{0}	:	\maya{2}	:	\maya{4}
.	\maya{1}	:	\maya{3}		\maya{5}

TABLE 201: Miscellaneous L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> Math Symbols

ℵ	\aleph	◊	\Diamond*	∞	\infty	/	\prime
∠	\angle	◊	\diamondsuit	ℳ	\mho*	#	\sharp
\	\backslash	∅	\emptyset <sup>‡</sup>	∇	\nabla	♠	\spadesuit
□	\Box <sup>*,†</sup>	flat	\flat	natural	\natural	✓	\surd
♣	\clubsuit	♡	\heartsuit	¬	\neg	△	\triangle

\* Not predefined in L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub>. Use one of the packages `latexsym`, `amsfonts`, `amssymb`, `txfonts`, `pxfonts`, or `wasysym`. Note, however, that `amsfonts` and `amssymb` define `\Diamond` to produce the same glyph as `\lozenge` (“◊”); the other packages produce a squarer `\Diamond` as depicted above.

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

‡ Many people prefer the look of *AMS*'s `\varnothing` (“∅”, Table 202) to that of L<sup>A</sup>T<sub>E</sub>X's `\emptyset`.

TABLE 202: Miscellaneous *AMS* Math Symbols

⟨	\angle	▼	\blacktriangledown	ℳ	\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	ℳ	\mho*	✗	\varangle
---	------	---	----------	---	-------	---	-----------

\* `wasysym` also defines an `\agem0` symbol, which is the same glyph as `\mho` but is intended for use in text mode.

TABLE 204: Miscellaneous `txfonts/pxfonts` Math Symbols

◆	\Diamondblack	λ	\lambdaslash	♥	\varheartsuit
◊	\Diamonddot	♂	\varclubsuit	♀	\varspadesuit
λ	\lambdaabar	♦	\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

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

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

TABLE 207: Miscellaneous Internal MnSymbol Math Symbols

$\cdots$	<code>\partialvardint</code>	$\cdots$	<code>\partialvartint</code>
$\curvearrowleft$	<code>\partialvardlanddownint</code>	$\curvearrowright$	<code>\partialvartlanddownint</code>
$\curvearrowup$	<code>\partialvardlandupint</code>	$\curvearrowleft$	<code>\partialvartlandupint</code>
$\circlearrowleft$	<code>\partialvardlcircleleftint</code>	$\circlearrowright$	<code>\partialvartlcircleleftint</code>
$\circlearrowright$	<code>\partialvardlcirclerightint</code>	$\circlearrowleft$	<code>\partialvartlcirclerightint</code>
$\circlearrowleft$	<code>\partialvardoint</code>	$\circlearrowright$	<code>\partialvartooint</code>
$\circlearrowright$	<code>\partialvardoint</code>	$\circlearrowleft$	<code>\partialvartoint</code>
$\circlearrowleft$	<code>\partialvardrcircleleftint</code>	$\circlearrowright$	<code>\partialvartrccircleleftint</code>
$\circlearrowright$	<code>\partialvardrcirclerightint</code>	$\circlearrowleft$	<code>\partialvartrccirclerightint</code>
$\dashv$	<code>\partialvardstrokedint</code>	$\dashv$	<code>\partialvartstrokedint</code>
$\Sigma$	<code>\partialvardsumint</code>	$\Sigma$	<code>\partialvartsumint</code>

These symbols are intended to be used internally by MnSymbol to construct the integrals appearing in Table 64 on page 32 but can nevertheless be used in isolation.

TABLE 208: Miscellaneous textcomp Text-mode Math Symbols

$\circ$	<code>\textdegree*</code>	$\frac{1}{2}$	<code>\textonehalf†</code>	$\frac{3}{4}$	<code>\textthreequarters†</code>
$\div$	<code>\textdiv</code>	$\frac{1}{4}$	<code>\textonequarter†</code>	$\frac{3}{8}$	<code>\textthreesuperior</code>
$/$	<code>\textfractionsolidus</code>	$\frac{1}{2}$	<code>\textonesuperior</code>	$\times$	<code>\texttimes</code>
$-$	<code>\textlnot</code>	$\pm$	<code>\textpm</code>	$\frac{2}{2}$	<code>\texttwosuperior</code>
$-$	<code>\textminusus</code>	$\sqrt{\phantom{x}}$	<code>\textsurd</code>		

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

† 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

$\triangleleft$	<code>\Anglesign</code>	$\cdot$	<code>\Squaredot</code>	$\rightarrow$	<code>\Vectorarrowhigh</code>
$\cong$	<code>\Corresponds</code>	$\rightarrow$	<code>\Vectorarrow</code>		

TABLE 210: Miscellaneous `fge` Math Symbols

$\backslash$	<code>\fgebackslash</code>	$\sim$	<code>\fgecap</code>	$\curvearrowleft$	<code>\fgecupacute</code>	$\curvearrowleft$	<code>\fgelangle</code>
$\lrcorner$	<code>\fgebaracute</code>	$\trianglelefteq$	<code>\fgecapbar</code>	$\asymp$	<code>\fgecupbar</code>	$\sqsubset$	<code>\fgeupbracket</code>
$\approx$	<code>\fgebarcap</code>	$\cup$	<code>\fgecup</code>	$\curvearrowright$	<code>\fgeinfty</code>		

TABLE 211: Miscellaneous `mathdesign` Math Symbols

$\llcorner$  `\rightangle`

TABLE 212: Miscellaneous `arev` Math Symbols

$\clubsuit$	<code>\steaming</code>	$\spadesuit$	<code>\vardiamond</code>	$\heartsuit$	<code>\varsquare</code>
$\clubsuit$	<code>\varclub</code>	$\spadesuit$	<code>\varheart</code>		

TABLE 213: Math Alphabets

Font sample	Generating command	Required package
ABCdef123	<code>\mathrm{ABCdef123}</code>	<i>none</i>
<i>ABCdef123</i>	<code>\mathit{ABCdef123}</code>	<i>none</i>
<i>ABCdef123</i>	<code>\mathnormal{ABCdef123}</code>	<i>none</i>
<i>ABC</i>	<code>\mathcal{ABC}</code>	<i>none</i>
<i>A<small>B</small>C</i>	<code>\mathscr{ABC}</code>	<code>mathrsfs</code>
<i>or</i>	<code>\mathcal{ABC}</code>	<code>calrsfs</code>
<i>A<small>B</small>C</i>	<code>\mathcal{ABC}</code>	<code>euscript</code> with the <code>mathcal</code> option
<i>or</i>	<code>\mathscr{ABC}</code>	<code>euscript</code> with the <code>mathscr</code> option
<i>ABCdef123</i>	<code>\mathpzc{ABCdef123}</code>	<i>none</i> ; manually defined*
<i>ABC</i>	<code>\mathbb{ABC}</code>	<code>amsfonts</code> , <sup>§</sup> <code>amssymb</code> , <code>txfonts</code> , or <code>pxfonts</code>
<i>ABC</i>	<code>\varmathbb{ABC}</code>	<code>txfonts</code> or <code>pxfonts</code>
<i>ABCdef123</i>	<code>\mathbb{ABCdef123}</code>	<code>bbold</code> or <code>mathbbol</code> <sup>†</sup>
<i>ABCdef123</i>	<code>\mathbb{ABCdef123}</code>	<code>mbboard</code> <sup>†</sup>
<i>ABCdef12</i>	<code>\mathbbm{ABCdef12}</code>	<code>bbm</code>
<i>ABCdef12</i>	<code>\mathbbmss{ABCdef12}</code>	<code>bbm</code>
<i>ABCdef12</i>	<code>\mathbbmtt{ABCdef12}</code>	<code>bbm</code>
<i>ABC1</i>	<code>\mathds{ABC1}</code>	<code>dfont</code>
<i>A<small>B</small>C1</i>	<code>\mathds{ABC1}</code>	<code>dfont</code> with the <code>sans</code> option
<i>ABC</i>	<code>\symA\symB\symC</code>	<code>china2e</code> <sup>‡</sup>
<i>A<small>B</small>Cdef123</i>	<code>\mathfrak{ABCdef123}</code>	<code>eufrak</code>
<i>A<small>B</small>Cdef123</i>	<code>\textfrak{ABCdef123}</code>	<code>yfonts</code> <sup>¶</sup>
<i>A<small>B</small>Cdef123</i>	<code>\textswab{ABCdef123}</code>	<code>yfonts</code> <sup>¶</sup>
<i>A<small>B</small>C<small>c</small>ef123</i>	<code>\textgoth{ABCdef123}</code>	<code>yfonts</code> <sup>¶</sup>

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

† The `mathbbol` package defines some additional blackboard bold characters: parentheses, square brackets, angle brackets, and—if the `bbgreekl` option is passed to `mathbbol`—Greek letters. For instance, “ $\langle[\alpha\beta\gamma]\rangle$ ” is produced by “`\mathbb{Langle}\Lbrack\Lparan\bbalpha\bbbeta\bbgamma\Rparan\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` (“ $\nabla$ ”)—but also *all* punctuation marks, various currency symbols such as `\bbdollar` (“\$”) and `\bbeuro` (“€”), and the Hebrew alphabet (e.g., “`\bbfinalnum\bbyod\bbqof\bbpe`” → “ $\aleph\daleth\aleph\aleph\aleph$ ”).

<sup>‡</sup> The `\sym...` commands provided by the `GrN2e` 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, `GrN2e` provides three umlauted blackboard-bold letters: `\symAE` (“ $\mathbb{A}$ ”), `\symOE` (“ $\mathbb{O}$ ”), and `\symUE` (“ $\mathbb{U}$ ”). Note that `GrN2e` does provide math-mode commands for the most common number-set symbols. These are presented in Table 130 on page 56.

<sup>¶</sup> 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.

<sup>§</sup> An older (i.e., prior to 1991) version of the  $\mathcal{AM}$ S’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  $\mathcal{AM}$ S’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  $\text{\LaTeX} 2\epsilon$  packages for utilizing the now-obsolete glyphs.

## 4 Science and technology symbols

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

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

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

TABLE 215: `wasymp` Electrical and Physical Symbols

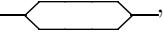
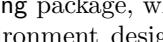
$\sim$	<code>\AC</code>	$\approx$	<code>\VHF</code>	$\sim\sim\sim$	<code>\photon</code>	$F$	<code>\HF</code>	$\gamma\gamma\gamma\gamma\gamma$	<code>\gluon</code>
--------	------------------	-----------	-------------------	----------------	----------------------	-----	------------------	----------------------------------	---------------------

TABLE 216: `ifsym` Pulse Diagram Symbols

$\text{L}$	<code>\FallingEdge</code>	$\text{L}$	<code>\LongPulseLow</code>	$\text{L}$	<code>\PulseLow</code>	$\text{L}$	<code>\ShortPulseHigh</code>
$\text{L}$	<code>\LongPulseHigh</code>	$\text{L}$	<code>\PulseHigh</code>	$\text{L}$	<code>\RaisingEdge</code>	$\text{L}$	<code>\ShortPulseLow</code>

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 “”. “`\textifsym{b}`” outputs a blank with the same width as an “.

TABLE 217: `ar` Aspect Ratio Symbol

$$\mathcal{A} \text{R} \quad \backslash \text{AR}$$

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

$^{\circ}\text{C}$	<code>\textcelsius</code>	$\text{U}$	<code>\textmho</code>	$\mu$	<code>\textmu</code>	$\Omega$	<code>\textohm</code>
--------------------	---------------------------	------------	-----------------------	-------	----------------------	----------	-----------------------

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	♀	\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: `wasymsym` APL Symbols

$\square$	<code>\APLbox</code>	$\square$	<code>\APLinv</code>	$*$	<code>\APLstar</code>
$\alpha$	<code>\APLcomment</code>	$\square$	<code>\APLleftarrowbox</code>	$\Delta$	<code>\APLup</code>
$\nabla$	<code>\APLdown</code>	$\odot$	<code>\APLlog</code>	$\square \uparrow$	<code>\APLuparrowbox</code>
$\square \downarrow$	<code>\APLdownarrowbox</code>	$-$	<code>\APLminus</code>	$\dot{\wedge}$	<code>\notbackslash</code>
$\square$	<code>\APLinput</code>	$\square$	<code>\APLrightarrowbox</code>	$\dot{/}$	<code>\notslash</code>

TABLE 224: `wasymsym` APL Modifiers

$\circ$  `\APLcirc{}`       $\sim$  `\APLnot{}`      | `\APLvert{}`

TABLE 225: `marvosym` Computer Hardware Symbols

$\square \leftarrow$	<code>\ComputerMouse</code>	$\square \parallel$	<code>\ParallelPort</code>	$\square \square$	<code>\SerialInterface</code>
$\square$	<code>\Keyboard</code>	$\square$	<code>\Printer</code>	$\square \square$	<code>\SerialPort</code>

TABLE 226: `keystroke` Computer Keys

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

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

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

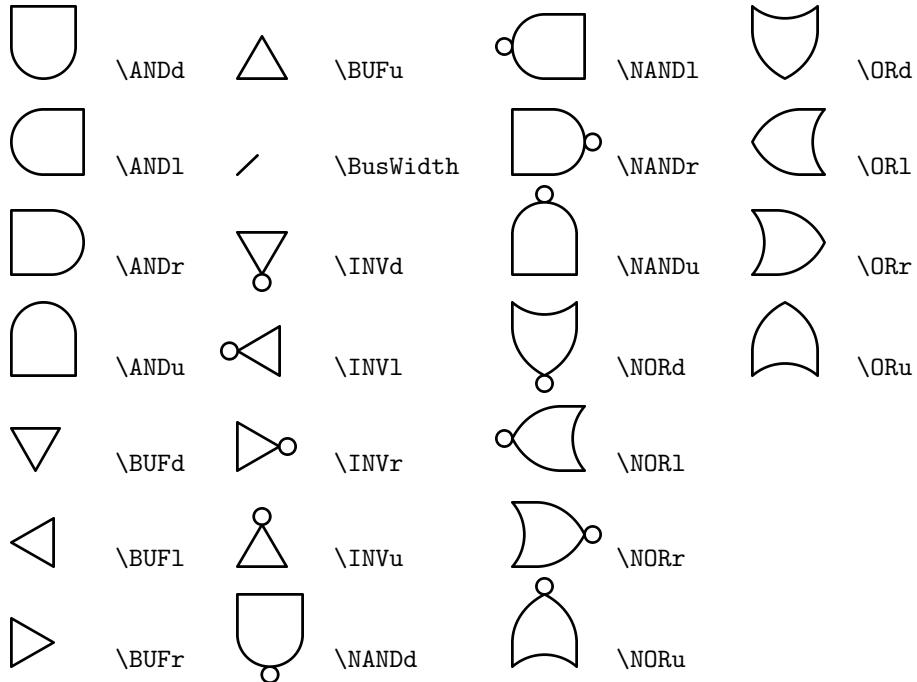
The `\keystroke` command draws a key with an arbitrary label. For example, “`\keystroke{F7}`” produces “”.

TABLE 227: ascii Control Characters (CP437)

◎	\SOH	■	\BS	*	\SI	-	\SYN	↔	\GS
●	\STX	○	\HT	▶	\DLE	‡	\ETB	▲	\RS
♥	\ETX	▣	\LF	◀	\DCa	↑	\CAN	▼	\US
♦	\EOT	♂	\VT	↓	\DCb	↓	\EM		
♣	\ENQ	♀	\FF	!!	\DCc	→	\SUB		
♠	\ACK	♪	\CR	¶	\DCd	←	\ESC		
•	\BEL	♫	\SO	§	\NAK	└	\FS		
	△	\DEL	▀	\NBSP	▀	\NUL		\splitvert	

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

TABLE 228: milstd Logic Gates



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

TABLE 229: marvosym Communication Symbols

	\Email		\fax		\Faxmachine		\Lightning		\Pickup
	\Emailct		\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		\CEsign		\Explosionsafe		\Radioactivity
	\BSEfree		\Estatically		\Laserbeam		\Stopsign

TABLE 234: feyn Feynman Diagram Symbols

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

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 L<sup>A</sup>T<sub>E</sub>X 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

	<code>\ArrowBoldDownRight</code>		<code>\ArrowBoldRightShort</code>		<code>\ArrowBoldUpRight</code>
	<code>\ArrowBoldRightCircled</code>		<code>\ArrowBoldRightStrobe</code>		

TABLE 236: `pifont` Arrows

	<code>\ding{212}</code>		<code>\ding{213}</code>		<code>\ding{214}</code>		<code>\ding{215}</code>		<code>\ding{216}</code>		<code>\ding{217}</code>		<code>\ding{218}</code>		<code>\ding{219}</code>		<code>\ding{220}</code>
	<code>\ding{221}</code>		<code>\ding{222}</code>		<code>\ding{223}</code>		<code>\ding{224}</code>		<code>\ding{225}</code>		<code>\ding{226}</code>		<code>\ding{227}</code>		<code>\ding{228}</code>		<code>\ding{229}</code>
	<code>\ding{230}</code>		<code>\ding{231}</code>		<code>\ding{232}</code>		<code>\ding{233}</code>		<code>\ding{234}</code>		<code>\ding{235}</code>		<code>\ding{236}</code>		<code>\ding{237}</code>		<code>\ding{238}</code>
	<code>\ding{239}</code>		<code>\ding{240}</code>		<code>\ding{241}</code>		<code>\ding{242}</code>		<code>\ding{243}</code>		<code>\ding{244}</code>		<code>\ding{245}</code>		<code>\ding{246}</code>		<code>\ding{247}</code>
	<code>\ding{248}</code>		<code>\ding{249}</code>		<code>\ding{250}</code>		<code>\ding{251}</code>		<code>\ding{252}</code>		<code>\ding{253}</code>		<code>\ding{254}</code>				

TABLE 237: universal Arrows

	<code>\bauarrow</code>		<code>\bauwhitearrow</code>
--	------------------------	--	-----------------------------

TABLE 238: marvosym Scissors

	<code>\Cutleft</code>		<code>\Cutright</code>		<code>\Leftscissors</code>
	<code>\Cutline</code>		<code>\Kutline</code>		<code>\Rightscissors</code>

TABLE 239: `bbding` Scissors

	<code>\ScissorHollowLeft</code>		<code>\ScissorLeftBrokenTop</code>
	<code>\ScissorHollowRight</code>		<code>\ScissorRight</code>
	<code>\ScissorLeft</code>		<code>\ScissorRightBrokenBottom</code>
	<code>\ScissorLeftBrokenBottom</code>		<code>\ScissorRightBrokenTop</code>

TABLE 240: pifont Scissors

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

TABLE 241: dingbat Pencils



TABLE 242: bbding Pencils and Nibs

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

TABLE 243: pifont Pencils and Nibs

 \ding{46}  \ding{47}  \ding{48}  \ding{49}  \ding{50}

TABLE 244: dingbat Fists

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

TABLE 245: bbding Fists

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

TABLE 246: pifont Fists

 \ding{42}  \ding{43}  \ding{44}  \ding{45}

TABLE 247: fourier Fists

 \lefthand  \righthand

TABLE 248: bbdng Crosses and Plusss

$\text{+}$	<code>\Cross</code>	$\text{+}$	<code>\CrossOpenShadow</code>	$\text{+}$	<code>\PlusOutline</code>
$\text{+}$	<code>\CrossBoldOutline</code>	$\text{+}$	<code>\CrossOutline</code>	$\text{+}$	<code>\PlusThinCenterOpen</code>
$\text{+}$	<code>\CrossCloverTips</code>	$\text{+}$	<code>\Plus</code>		
$\text{+}$	<code>\CrossMaltese</code>	$\text{+}$	<code>\PlusCenterOpen</code>		

TABLE 249: pifont Crosses and Plusss

$\text{+}$	<code>\ding{57}</code>	$\text{+}$	<code>\ding{59}</code>	$\text{+}$	<code>\ding{61}</code>	$\text{+}$	<code>\ding{63}</code>
$\text{+}$	<code>\ding{58}</code>	$\text{+}$	<code>\ding{60}</code>	$\text{+}$	<code>\ding{62}</code>	$\text{+}$	<code>\ding{64}</code>

TABLE 250: bbdng Xs and Check Marks

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

TABLE 251: pifont Xs and Check Marks

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

TABLE 252: wasysym Xs and Check Marks

$\square$	<code>\CheckedBox</code>	$\square$	<code>\Square</code>	$\square$	<code>\XBox</code>
-----------	--------------------------	-----------	----------------------	-----------	--------------------

TABLE 253: universal Xs

$\times$	<code>\baucross</code>
----------	------------------------

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}	❷ \ding{188}	⑦ \ding{198}	❷ \ding{208}
⑧ \ding{179}	❸ \ding{189}	⑧ \ding{199}	❸ \ding{209}
⑨ \ding{180}	❹ \ding{190}	⑨ \ding{200}	❹ \ding{210}
⑩ \ding{181}	❽ \ding{191}	⑩ \ding{201}	❽ \ding{211}

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

TABLE 255: wasysym Stars

◊ \davidsstar \* \hexstar \* \varhexstar

TABLE 256: bbdng Stars, Flowers, and Similar Shapes

* \Asterisk	❖ \FiveFlowerPetal	◆ \JackStar
* \AsteriskBold	★ \FiveStar	◆ \JackStarBold
* \AsteriskCenterOpen	☆ \FiveStarCenterOpen	* \SixFlowerAlternate
* \AsteriskRoundedEnds	☆ \FiveStarConvex	* \SixFlowerAltPetal
* \AsteriskThin	☆ \FiveStarLines	* \SixFlowerOpenCenter
* \AsteriskThinCenterOpen	☆ \FiveStarOpen	◆ \SixFlowerPetalDotted
◊ \DavidStar	◊ \FiveStarOpenCircled	* \SixFlowerPetalRemoved
★ \DavidStarSolid	★ \FiveStarOpenDotted	* \SixFlowerRemovedOpenPetal
* \EightAsterisk	★ \FiveStarOutline	★ \SixStar
* \EightFlowerPetal	★ \FiveStarOutlineHeavy	* \SixteenStarLight
* \EightFlowerPetalRemoved	★ \FiveStarShadow	* \Snowflake
* \EightStar	◆ \FourAsterisk	* \SnowflakeChevron
* \EightStarBold	◆ \FourCloverOpen	* \SnowflakeChevronBold
* \EightStarConvex	◆ \FourCloverSolid	* \Sparkle
* \EightStarTaper	◆ \FourStar	* \SparkleBold
* \FiveFlowerOpen	◆ \FourStarOpen	* \TwelveStar

<sup>4</sup>In fact, `dingautolist` can use any set of consecutive Zapf Dingbats symbols.

TABLE 257: pifont Stars, Flowers, and Similar Shapes

$\diamond$	$\backslash ding\{65\}$	$\heartsuit$	$\backslash ding\{74\}$	$*$	$\backslash ding\{83\}$	$*$	$\backslash ding\{92\}$	$*$	$\backslash ding\{101\}$
$\ddagger$	$\backslash ding\{66\}$	$\star$	$\backslash ding\{75\}$	$*$	$\backslash ding\{84\}$	$*$	$\backslash ding\{93\}$	$*$	$\backslash ding\{102\}$
$\ddot{\dagger}$	$\backslash ding\{67\}$	$\star$	$\backslash ding\{76\}$	$*$	$\backslash ding\{85\}$	$*$	$\backslash ding\{94\}$	$*$	$\backslash ding\{103\}$
$\ddot{\ddagger}$	$\backslash ding\{68\}$	$\star$	$\backslash ding\{77\}$	$\star$	$\backslash ding\{86\}$	$\clubsuit$	$\backslash ding\{95\}$	$*$	$\backslash ding\{104\}$
$\ddot{\ddot{\dagger}}$	$\backslash ding\{69\}$	$\star$	$\backslash ding\{78\}$	$*$	$\backslash ding\{87\}$	$\clubsuit$	$\backslash ding\{96\}$	$*$	$\backslash ding\{105\}$
$\ddot{\ddot{\ddagger}}$	$\backslash ding\{70\}$	$\star$	$\backslash ding\{79\}$	$*$	$\backslash ding\{88\}$	$\clubsuit$	$\backslash ding\{97\}$	$*$	$\backslash ding\{106\}$
$\ddot{\ddot{\ddot{\dagger}}}$	$\backslash ding\{71\}$	$\star$	$\backslash ding\{80\}$	$*$	$\backslash ding\{89\}$	$\clubsuit$	$\backslash ding\{98\}$	$*$	$\backslash ding\{107\}$
$\ddot{\ddot{\ddot{\ddagger}}}$	$\backslash ding\{72\}$	$*$	$\backslash ding\{81\}$	$*$	$\backslash ding\{90\}$	$*$	$\backslash ding\{99\}$		
$\ddot{\ddot{\ddot{\ddot{\dagger}}}}$	$\backslash ding\{73\}$	$*$	$\backslash ding\{82\}$	$*$	$\backslash ding\{91\}$	$*$	$\backslash ding\{100\}$		

TABLE 258: fourier Ornaments

$\textcircled{s}$	$\backslash aldine$	$\textcircled{x}$	$\backslash decoone$	$\textcircled{z}$	$\backslash floweroneright$
$\textcircled{g}$	$\backslash aldineleft$	$\textcircled{d}$	$\backslash decosix$	$\textcircled{e}$	$\backslash leafleft$
$\textcircled{e}$	$\backslash aldineright$	$\textcircled{n}$	$\backslash decothreeleft$	$\textcircled{f}$	$\backslash leafNE$
$\textcircled{b}$	$\backslash aldinesmall$	$\textcircled{u}$	$\backslash decothreeright$	$\textcircled{g}$	$\backslash leafright$
$\textcircled{o}$	$\backslash decofourleft$	$\textcircled{v}$	$\backslash decotwo$	$\textcircled{+}$	$\backslash starredbullet$
$\textcircled{w}$	$\backslash decofourright$	$\textcircled{y}$	$\backslash floweroneleft$		

TABLE 259: wasysym Geometric Shapes

$\square$   $\backslash hexagon$   $\circlearrowleft$   $\backslash octagon$   $\triangleleft$   $\backslash pentagon$   $\circlearrowright$   $\backslash varhexagon$

TABLE 260: MnSymbol Geometric Shapes

$\star$	$\backslash filledlargestar$	$\diamondsuit$	$\backslash largediamond$	$\star$	$\backslash largestar$	$\diamond$	$\backslash smalllozenge$
$\blacklozenge$	$\backslash filledlozenge$	$\lozenge$	$\backslash largelozenge$	$\lozenge$	$\backslash largestarofdavid$		
$\blacklozenge$	$\backslash filledmedlozenge$	$\star$	$\backslash largepentagram$	$\lozenge$	$\backslash medlozenge$		
$\bigcirc$	$\backslash largecircle$	$\square$	$\backslash largesquare$	$\lozenge$	$\backslash medstarofdavid$		

MnSymbol defines  $\bigcirc$  as a synonym for  $\largecircle$ ;  $\star$  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: bbdng 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	■	\lausquare	▲	\autriangle
---	------------	---	------------	---	-------------

TABLE 265: universal Geometric Shapes

▣	\baucircle	●	\bauhole	■	\lausquare
●	\baueclipse	●	\baupunct	▲	\autriangle

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

TABLE 270: protosem Proto-Semitic Characters

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

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

TABLE 271: *hieroglif* Hieroglyphics

	\HA		\HI		\Hn		\HT
	\HB		\Hibl		\HO		\Ht
	\Hb		\Hibp		\Hp		\Htongue
	\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		
I	\Hone		\Hhundred		\HXthousand		\Hmillion
O	\Hten		\Hthousand		\HCthousand		

The *hieroglif* 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 *hieroglif* documentation for more information.

TABLE 272: *linearA* Linear A Script

	\LinearAI		\LinearACIX		\LinearACXCVII		\LinearACCXCV
	\LinearAII		\LinearAC		\LinearACXCVIII		\LinearACCXCVI
	\LinearAIII		\LinearACI		\LinearACXIX		\LinearACCXCVII
	\LinearAIV		\LinearACII		\LinearACC		\LinearACCXCVIII
	\LinearAV		\LinearACIII		\LinearACCI		\LinearACCXCIX
	\LinearAVI		\LinearACIV		\LinearACII		\LinearACCC
	\LinearAVII		\LinearACV		\LinearACCI		\LinearACCCI
	\LinearAVIII		\LinearACVI		\LinearACIV		\LinearACCI
	\LinearAIX		\LinearACVII		\LinearACCV		\LinearACCCIII

(continued on next page)

(continued from previous page)

𠂔	\LinearAX	݌	\LinearACVIII	ܺ	\LinearACCVI	ܻ	\LinearACCCIV
⊕	\LinearAXI	ݍ	\LinearACIX	ܹ	\LinearACCVII	ܵ	\LinearACCCV
ܰ	\LinearAXII	ݎ	\LinearACX	ܷ	\LinearACCVIII	ܶ	\LinearACCCVI
ܱ	\LinearAXIII	ݏ	\LinearACXI	ܸ	\LinearACCIX	ܸ	\LinearACCCVII
ܲ	\LinearAXIV	ݐ	\LinearACXII	ܹ	\LinearACCX	ܸ	\LinearACCCVIII
ܳ	\LinearAXV	ݑ	\LinearACXIII	ܹ	\LinearACCI	ܸ	\LinearACCCIX
ܴ	\LinearAXVI	ݒ	\LinearACXIV	ܹ	\LinearACCXII	ܸ	\LinearACCCX
ܵ	\LinearAXVII	ݓ	\LinearACXV	ܶ	\LinearACCXIII	ܸ	\LinearACCCXI
ܶ	\LinearAXVIII	ݔ	\LinearACXVI	ܶ	\LinearACCXIV	ܸ	\LinearACCCXII
ܷ	\LinearAXIX	ݕ	\LinearACXVII	ܶ	\LinearACCV	ܸ	\LinearACCCXIII
ܸ	\LinearAXX	ݖ	\LinearACXVIII	ܶ	\LinearACCVI	ܸ	\LinearACCCXIV
ܹ	\LinearAXXI	ݗ	\LinearACXIX	ܶ	\LinearACCVII	ܸ	\LinearACCCV
ܺ	\LinearAXXII	ݘ	\LinearACXX	ܶ	\LinearACCVIII	ܸ	\LinearACCCXVI
ܻ	\LinearAXXIII	ݙ	\LinearACXXI	ܶ	\LinearACCXIX	ܸ	\LinearACCCXVII
ܼ	\LinearAXXIV	ݚ	\LinearACXXII	ܶ	\LinearACXXX	ܸ	\LinearACCCXVIII
ܹ	\LinearAXXV	݊	\LinearACXXIII	ܶ	\LinearACXXI	ܸ	\LinearACCCXIX
ܻ	\LinearAXXVI	݋	\LinearACXXIV	ܶ	\LinearACXXII	ܸ	\LinearACCCXX
ܼ	\LinearAXXVII	݌	\LinearACXXV	ܶ	\LinearACXXIII	ܸ	\LinearACCCXXI
ܹ	\LinearAXXVIII	ݍ	\LinearACXXVI	ܶ	\LinearACXXIV	ܸ	\LinearACCCXXII
ܻ	\LinearAXXIX	ݎ	\LinearACXXVII	ܶ	\LinearACXXV	ܸ	\LinearACCCXXIII
ܼ	\LinearAXXX	ݏ	\LinearACXXVIII	ܶ	\LinearACXXVI	ܸ	\LinearACCCXXIV
ܹ	\LinearAXXXI	ݏ	\LinearACXXIX	ܶ	\LinearACXXVII	ܸ	\LinearACCCXXV
ܻ	\LinearAXXXII	݈	\LinearACXXX	ܶ	\LinearACXXVIII	ܸ	\LinearACCCXXVI
ܼ	\LinearAXXXIII	݉	\LinearACXXXI	ܶ	\LinearACXXIX	ܸ	\LinearACCCXXVII
ܹ	\LinearAXXXIV	݊	\LinearACXXXII	ܶ	\LinearACXXX	ܸ	\LinearACCCXXVIII
ܻ	\LinearAXXXV	݋	\LinearACXXXIII	ܶ	\LinearACXXXI	ܸ	\LinearACCCXXIX
ܼ	\LinearAXXXVI	݌	\LinearACXXXIV	ܶ	\LinearACXXXII	ܸ	\LinearACCCXXX
ܹ	\LinearAXXXVII	ݍ	\LinearACXXXV	ܶ	\LinearACXXXIII	ܸ	\LinearACCCXXXI
ܻ	\LinearAXXXVIII	ݎ	\LinearACXXXVI	ܶ	\LinearACXXXIV	ܸ	\LinearACCCXXXII
ܼ	\LinearAXXXIX	ݏ	\LinearACXXXVII	ܶ	\LinearACXXXV	ܸ	\LinearACCCXXXIII
ܹ	\LinearAXL	݇	\LinearACXXXVIII	ܶ	\LinearACXXXVI	ܸ	\LinearACCCXXXIV
ܻ	\LinearAXLI	݈	\LinearACXXXIX	ܶ	\LinearACXXXVII	ܸ	\LinearACCCXXXV
ܼ	\LinearAXLII	݉	\LinearACXL	ܶ	\LinearACXXXVIII	ܸ	\LinearACCCXXXVI
ܹ	\LinearAXLIII	݊	\LinearACXLII	ܶ	\LinearACXXXIX	ܸ	\LinearACCCXXXVII
ܻ	\LinearAXLIV	݋	\LinearACXLII	ܶ	\LinearACXL	ܸ	\LinearACCCXXXVIII
ܼ	\LinearAXLV	݌	\LinearACXLIII	ܶ	\LinearACXLII	ܸ	\LinearACCCXXXIX
ܶ	\LinearAXLVI	ݍ	\LinearACXLIV	ܶ	\LinearACXLII	ܸ	\LinearACCCXL
ܷ	\LinearAXL VII	ݏ	\LinearACXLV	ܶ	\LinearACXLIII	ܸ	\LinearACCCXLII
ܸ	\LinearAXL VIII	ݐ	\LinearACXLVI	ܶ	\LinearACXLIV	ܸ	\LinearACCCXLII
ܹ	\LinearAXLIX	ݑ	\LinearACXLVII	ܶ	\LinearACXLV	ܸ	\LinearACCCXLIII
ܻ	\LinearAL	ݒ	\LinearACXLVIII	ܶ	\LinearACXLVI	ܸ	\LinearACCCXLIV
ܼ	\LinearALI	ݓ	\LinearACLIX	ܶ	\LinearACXLVII	ܸ	\LinearACCCXLV
ܹ	\LinearALII	ݔ	\LinearACL	ܶ	\LinearACXLVIII	ܸ	\LinearACCCXLVI
ܻ	\LinearALIII	ݕ	\LinearACLI	ܶ	\LinearACXLIX	ܸ	\LinearACCCXLVII
ܼ	\LinearALIV	ݏ	\LinearACLII	ܶ	\LinearACCL	ܸ	\LinearACCCXLVIII
ܶ	\LinearALV	ݗ	\LinearACLIII	ܶ	\LinearACCLI	ܸ	\LinearACCCXLIX
ܷ	\LinearALVI	݈	\LinearACLIV	ܶ	\LinearACCLI	ܸ	\LinearACCL
ܸ	\LinearALVII	݉	\LinearACLV	ܶ	\LinearACCLI	ܸ	\LinearACCLI
ܹ	\LinearALVIII	݊	\LinearACLVI	ܶ	\LinearACCLI	ܸ	\LinearACCLII

(continued on next page)

(continued from previous page)

¶ \LinearALIX	¶ \LinearACLVII	¶ \LinearACCLV	¶ \LinearACCCLIII
¤ \LinearALX	¶ \LinearACLVIII	¶ \LinearACCLVI	¶ \LinearACCCLIV
¤ \LinearALXI	¶ \LinearACLIX	¶ \LinearACCLVII	¶ \LinearACCCLV
¤ \LinearALXII	¶ \LinearACLX	¶ \LinearACCLVIII	¶ \LinearACCCLVI
¤ \LinearALXIII	¶ \LinearACLXI	¶ \LinearACCLIX	¶ \LinearACCCLVII
¤ \LinearALXIV	¶ \LinearACLXII	¶ \LinearACCLX	¶ \LinearACCCLVIII
¤ \LinearALXV	¶ \LinearACLXIII	¶ \LinearACCLXI	¶ \LinearACCCLIX
¤ \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	¶ \LinearACXCII	¶ \LinearACCLXXXIX	¶ \LinearACCCLXXXVII
¤ \LinearAXCIV	¶ \LinearACXCII	¶ \LinearACCLXXXX	¶ \LinearACCCLXXXVIII
¤ \LinearAXCV	¶ \LinearACXCIII	¶ \LinearACXCII	¶ \LinearACCCLXXXIX
¤ \LinearAXCVI	¶ \LinearACXCIV	¶ \LinearACXCII	¶ \LinearACCCLXXXIX
¤ \LinearAXCVII	¶ \LinearACXCV	¶ \LinearACXCIII	¶ \LinearACCCLXXXIX
¶ \LinearAXCVIII	¶ \LinearACXCVI	¶ \LinearACXCIV	¶ \LinearACCCLXXXIX

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

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

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

TABLE 274: *linearb* Linear B Numerals

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

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

TABLE 275: *linearb* Linear B Weights and Measures

✚✚	\BPtalent	↑	\BPvolb	↑	\BPvolcf	⌚	\BPwtb	⌚	\BPwtd
✚	\BPvola	↑	\BPvolcd	↑	\BPwta	⌚	\BPwtc	⌚	

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

TABLE 276: `linearb` Linear B Ideograms

Ϙ	\BPamphora	Ϙ	\BPchassis	Ϙ	\BPman	Ϙ	\BPwheat
»	\BParrow	Ϙ	\BPcloth	Ϙ	\BPNanny	Ϙ	\BPwheel
Ϙ	\BPbarley	Ϙ	\BPCow	Ϙ	\BPolive	Ϙ	\BPwine
Ϙ	\BPbilly	Ϙ	\BPCup	Ϙ	\BPOx	Ϙ	\BPwineiih
Ϙ	\BPboar	Ϙ	\BPEwe	Ϙ	\BPPig	Ϙ	\BPwineiiih
Ϙ	\BPbronze	Ϙ	\BPFoal	Ϙ	\BPRam	Ϙ	\BPwineivh
Ϙ	\BPbull	Ϙ	\BPGoat	Ϙ	\BPSheep	Ϙ	\BPwoman
Ϙ	\BPcauldroni	Ϙ	\BPGoblet	Ϙ	\BPsow	Ϙ	\BPwool
Ϙ	\BPcauldronii	Ϙ	\BPGold	Ϙ	\BPspear		
Ϙ	\BPchariot	Ϙ	\BPhorse	Ϙ	\BPsword		

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

TABLE 277: `linearb` Unidentified Linear B Symbols

Ϙ	\BUi	Ϙ	\BUiv	Ϙ	\BUvii	Ϙ	\BUx	Ϙ	\Btwe
Ϙ	\BUii	Ϙ	\BUv	Ϙ	\BUviii	Ϙ	\BUxi		
Ϙ	\BUiii	Ϙ	\BUvi	Ϙ	\BUix	Ϙ	\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

Ϻ	\Ca	Ϻ	\Cku	Ϻ	\Cmu	Ϻ	\Cpo	Ϻ	\Cso	Ϻ	\Cwi
Ϻ	\Ce	Ϻ	\Cla	Ϻ	\Cna	Ϻ	\Cpu	Ϻ	\Csu	Ϻ	\Cwo
Ϻ	\Gga	Ϻ	\Cle	Ϻ	\Cne	Ϻ	\Cra	Ϻ	\Cta	Ϻ	\Cxa
Ϻ	\Ci	Ϻ	\Cli	Ϻ	\Cni	Ϻ	\Cre	Ϻ	\Cte	Ϻ	\Cxe
ϙ	\Cja	ϙ	\Clo	ϙ	\Cno	ϙ	\Cri	ϙ	\Cti	ϙ	\Cya
ϙ	\Cjo	ϙ	\Clu	ϙ	\Cnu	ϙ	\Cro	ϙ	\Cto	ϙ	\Cyo
ϙ	\Cka	ϙ	\Cma	ϙ	\Co	ϙ	\Cru	ϙ	\Ctu	ϙ	\Cza
ϙ	\Cke	ϙ	\Cme	ϙ	\Cpa	ϙ	\Csa	ϙ	\Cu	ϙ	\Czo
ϙ	\Cki	ϙ	\Cmi	ϙ	\Cpe	ϙ	\Cse	ϙ	\Cwa		
ϙ	\Cko	ϙ	\Cmo	ϙ	\Cpi	ϙ	\Csi	ϙ	\Cwe		

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

TABLE 279: *sarabian* South Arabian Letters

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

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

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

Ϙ	\Coppa <sup>†</sup>	F	\Digamma*	ϙ	\sampi*	ϙ	\varstigma
ϙ	\coppa <sup>†</sup>	ϙ	\koppa*	ϙ	\Stigma		
ϝ	\digamma*,‡	ϗ	\Sampi	Ϛ	\stigma*		

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

$\star$	<code>\textborn</code>	$\circ\circ$	<code>\textdivorced</code>	$\otimes$	<code>\textmarried</code>
$\dagger$	<code>\textdied</code>		<code>\textleaf</code>		

TABLE 282: `wasy sym` General Symbols

$\blacksquare$	<code>\ataribox</code>	$\odot$	<code>\clock</code>	$\blacktriangleleft$	<code>\LEFTarrow</code>	$\odot$	<code>\smiley</code>
$\blacktriangle$	<code>\bell</code>	$\oslash$	<code>\diameter</code>	$\swarrow$	<code>\lightning</code>	$\odot$	<code>\sun</code>
$\bullet$	<code>\blacksmiley</code>	$\blacktriangledown$	<code>\DONWarrow</code>	$\blacktriangleright$	<code>\phone</code>	$\blacktriangle$	<code>\UParrow</code>
$\bowtie$	<code>\Bowtie</code>	$\odot$	<code>\frownie</code>	$\Lsh$	<code>\pointer</code>	$\square$	<code>\wasylozenge</code>
$\vdash$	<code>\brokenvert</code>	$\oslash$	<code>\invdiameter</code>	$\oslash$	<code>\recorder</code>		
$\checkmark$	<code>\checked</code>	$\maltese$	<code>\kreuz</code>	$\blacktriangleright$	<code>\RIGHTarrow</code>		

TABLE 283: `wasy sym` Circles

$\bullet$	<code>\CIRCLE</code>	$\odot$	<code>\LEFTcircle</code>	$\bullet$	<code>\RIGHTcircle</code>	$\circlearrowright$	<code>\rightturn</code>
$\circ$	<code>\Circle</code>	$\odot$	<code>\Leftcircle</code>	$\odot$	<code>\Rightcircle</code>		
$\blacktriangleleft$	<code>\LEFTCIRCLE</code>	$\blacktriangleright$	<code>\RIGHTCIRCLE</code>	$\circlearrowleft$	<code>\lefturn</code>		

TABLE 284: `wasy sym` Musical Symbols

$\downarrow$	<code>\eighthnote</code>	$\downarrow$	<code>\halfnote</code>	$\downarrow$	<code>\twonotes</code>	$\cdot$	<code>\fullnote</code>	$\downarrow$	<code>\quaternernote</code>
--------------	--------------------------	--------------	------------------------	--------------	------------------------	---------	------------------------	--------------	-----------------------------

See also `\flat`, `\sharp`, and `\natural` (Table 201 on page 73).

TABLE 285: `arev` Musical Symbols

$\downarrow$	<code>\quaternernote</code>	$\downarrow$	<code>\eighthnote</code>	$\downarrow$	<code>\sixteenthnote</code>
--------------	-----------------------------	--------------	--------------------------	--------------	-----------------------------

See also `\flat`, `\sharp`, and `\natural` (Table 201 on page 73).

TABLE 286: *harmony* Musical Symbols

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

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

TABLE 287: *harmony* Musical Accents

	\Ferli{A}\Ferli{a}^*		\Ohne{A}\Ohne{a}^*
	\Fermi{A}\Fermi{a}		\Umd{A}\Umd{a}^*
	\Kr{A}\Kr{a}		

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

In addition to the accents shown above, \HH is a special accent command which accepts five period-separated characters and typesets them such that “\HH.X.a.b.c.d.” produces “X<sup>b</sup>”. 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		\lhbend		\reversedvideobend
--	--------	--	---------	--	--------------------

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

TABLE 289: Miscellaneous `manfnt` Symbols

○	<code>\manboldkidney</code>	○	<code>\manpenkidney</code>
◎	<code>\manconcentriccircles</code>	◎	<code>\manquadrifolium</code>
❖	<code>\manconcentricdiamond</code>	＼	<code>\manquartercircle</code>
▽	<code>\mancone</code>	⌚	<code>\manrotatedquadrifolium</code>
▣	<code>\mancube</code>	↶	<code>\manrotatedquartercircle</code>
↖→	<code>\manerrarrow</code>	☆	<code>\manstar</code>
■	<code>\manfilledquartercircle</code>	↶	<code>\mantiltedpennib</code>
—	<code>\manhpennib</code>	▼	<code>\mantriangledown</code>
▣	<code>\manimpossiblecube</code>	▶	<code>\mantriangleleft</code>
○	<code>\mankidney</code>	▲	<code>\mantriangleup</code>
○	<code>\manlhpennib</code>	↓	<code>\manvpennib</code>

TABLE 290: `marvosym` Navigation Symbols

▶	<code>\Forward</code>	▼	<code>\MoveDown</code>	◀◀	<code>\RewindToIndex</code>	▲	<code>\ToTop</code>
▶	<code>\ForwardToEnd</code>	▲	<code>\MoveUp</code>	◀	<code>\RewindToStart</code>		
▶▶	<code>\ForwardToIndex</code>	◀	<code>\Rewind</code>	▼	<code>\ToBottom</code>		

TABLE 291: `marvosym` Laundry Symbols

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

TABLE 292: `marvosym` Information Symbols

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

TABLE 293: Other *marvosym* Symbols

†	\Ankh	†	\Cross	♡	\Heart	☺	\Smiley
❖	\Bat	❖	\FHB0logo	❖	\MartinVogel	❖	\Womanface
❖	\Bouquet	❖	\FHB0LOGO	❖	\Mundus	❖	\Yinyang
❖	\Celtcross	❖	\Frowny	❖	\MVAt		
Ⓐ	\CircledA	❖	\FullFHBO	→	\MVRrightarrow		

TABLE 294: Miscellaneous *universa* Symbols

 \bauforms     \bauhead

TABLE 295: Miscellaneous *universal* Symbols

■	\baudash	◎	\bauforms	●	\bauquarter	○	\varQ
■	\bauequal	◎	\bauhead	■	\bauquestion		
◊	\bauface	■	\bauplus	■	\bauwindow		

TABLE 296: Miscellaneous *fourier* Symbols

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

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

TABLE 297: *ifsym* Weather Symbols

☁	\Cloud	☃	\Hail	❅	\Sleet	☂	\WeakRain
☁	\FilledCloud	☀	\HalfSun	❄	\Snow	🌧	\WeakRainCloud
☁	\FilledRainCloud	⚡	\Lightning	🌨	\SnowCloud	🌨	\FilledSnowCloud
☁	\FilledSunCloud	●	\NoSun	☀	\Sun		
霏	\FilledWeakRainCloud	🌧	\Rain	🌤	\SunCloud		
🌫	\Fog	霏	\RainCloud	🌫	\ThinFog		

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

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

TABLE 298: ifsym Alpine Symbols

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

TABLE 299: ifsym Clocks

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

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

TABLE 300: Other ifsym Symbols

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

TABLE 301: clock Clocks

\ClockStyle	\ClockFramefalse	\ClockFrametrue
0		
1		
2		
3		

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

TABLE 302: `epsdice` Dice

□	<code>\epsdice{1}</code>	▣	<code>\epsdice{3}</code>	▢	<code>\epsdice{5}</code>
□	<code>\epsdice{2}</code>	▣	<code>\epsdice{4}</code>	▢	<code>\epsdice{6}</code>

TABLE 303: `hhcount` Dice

▣	<code>\fcdice{1}</code>	▣	<code>\fcdice{3}</code>	▣	<code>\fcdice{5}</code>
▣	<code>\fcdice{2}</code>	▣	<code>\fcdice{4}</code>	▣	<code>\fcdice{6}</code>

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

TABLE 304: `hhcount` Tally Markers

	<code>\fcscore{1}</code>		<code>\fcscore{3}</code>		<code>\fcscore{5}</code>
	<code>\fcscore{2}</code>		<code>\fcscore{4}</code>		

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

TABLE 305: skull Symbols

 `\skull`

TABLE 306: Non-Mathematical `mathabx` Symbols

 `\rip`

TABLE 307: skak Chess Informator Symbols

$\mp$	<code>\bbetter</code>	$\circ$	<code>\doublepawns</code>	$\circ\circ$	<code>\seppawns</code>
$-+$	<code>\bdecisive</code>	$\perp$	<code>\ending</code>	$O-O$	<code>\shortcastling</code>
$\cap$	<code>\betteris</code>	$=$	<code>\equal</code>	$\oplus$	<code>\timelimit</code>
$\boxplus$	<code>\bishoppair</code>	$\Leftrightarrow$	<code>\file</code>	$\infty$	<code>\unclear</code>
$\mp$	<code>\bupperhand</code>	$\gg$	<code>\kside</code>	$\circ\circ$	<code>\unitedpawns</code>
$\times$	<code>\capturesymbol</code>	$O-O-O$	<code>\longcastling</code>	$R$	<code>\various</code>
$O$	<code>\castlingchar</code>	$X$	<code>\markera</code>	$\pm$	<code>\wbetter</code>
$-$	<code>\castlinghyphen</code>	$O$	<code>\markerb</code>	$+-$	<code>\wdecisive</code>
$\boxplus$	<code>\centre</code>	$\#$	<code>\mate</code>	$\times$	<code>\weakpt</code>
$+$	<code>\checkssymbol</code>	$>$	<code>\morepawns</code>	$\sqsubset$	<code>\with</code>
$RR$	<code>\chesscomment</code>	$\circ$	<code>\moreroom</code>	$\rightarrow$	<code>\withattack</code>
$  $	<code>\chessetc</code>	$N$	<code>\novelty</code>	$\triangle$	<code>\withidea</code>
$-$	<code>\chesssee</code>	$\square$	<code>\onlymove</code>	$\uparrow$	<code>\withinit</code>
$\mp$	<code>\compensation</code>	$\blacksquare$	<code>\opposbishops</code>	$\sqcup$	<code>\without</code>
$\leftarrow$	<code>\counterplay</code>	$\diamond$	<code>\passedpawn</code>	$\pm$	<code>\wupperhand</code>
$\circlearrowright$	<code>\devadvantage</code>	$\ll$	<code>\qside</code>	$\odot$	<code>\zugzwang</code>
$\nearrow$	<code>\diagonal</code>	$\blacksquare$	<code>\samebishops</code>		

TABLE 308: skak Chess Pieces and Chessboard Squares

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

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

TABLE 309: *igo* Go Stones

◎	<code>\blackstone[\igocircle]</code>	◎	<code>\whitestone[\igocircle]</code>
⊗	<code>\blackstone[\igocross]</code>	⊗	<code>\whitestone[\igocross]</code>
●	<code>\blackstone[\igonone]</code>	○	<code>\whitestone[\igonone]</code>
□	<code>\blackstone[\igosquare]</code>	□	<code>\whitestone[\igosquare]</code>
△	<code>\blackstone[\igotriangle]</code>	△	<code>\whitestone[\igotriangle]</code>

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, ..., ❹ and ①, ②, ③, ..., ⑨, respectively.

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

TABLE 310: *metre* Metrical Symbols

×	<code>\a</code>	<code>\wedge</code>	<code>\bBm</code>	<code>  </code>	<code>\cc</code>	<code>\wedge</code>	<code>\Mbb</code>	<code>:</code>	<code>\Pppp</code>	<code>\otimes</code>	<code>\t</code>
⌚	<code>\B</code>	<code>\wedge</code>	<code>\bbm</code>	<code>   </code>	<code>\Ccc</code>	<code>\wedge</code>	<code>\mbbx</code>	<code>:</code>	<code>\pppp</code>	<code>\_</code>	<code>\tsbm</code>
⌚	<code>\b</code>	<code>\wedge</code>	<code>\Bbm</code>	<code>-</code>	<code>\m</code>	<code>\circ</code>	<code>\oo</code>	<code>:</code>	<code>\Ppppp</code>	<code>\_</code>	<code>\tsmb</code>
⌚	<code>\Bb</code>	<code>\wedge</code>	<code>\bbmb</code>	<code>\_</code>	<code>\M</code>	<code>.</code>	<code>\p</code>	<code>\_</code>	<code>\ppppp</code>	<code>\_</code>	<code>\tsmm</code>
⌚	<code>\BB</code>	<code>\wedge</code>	<code>\bbmx</code>	<code>\_x</code>	<code>\ma</code>	<code>\_</code>	<code>\pm</code>	<code>\_</code>	<code>\ps</code>	<code>\_:</code>	<code>\vppm</code>
⌚	<code>\bb</code>	<code>\wedge</code>	<code>\bm</code>	<code>\_z</code>	<code>\Mb</code>	<code>:</code>	<code>\pp</code>	<code>:</code>	<code>\pxp</code>	<code>\_:</code>	<code>\vpppm</code>
⌚	<code>\bB</code>	<code>\wedge</code>	<code>\Bm</code>	<code>\_o</code>	<code>\mb</code>	<code>:</code>	<code>\Pp</code>	<code>:</code>	<code>\Pxp</code>	<code>::</code>	<code>\x</code>
⌚	<code>\bba</code>	<code> </code>	<code>\c</code>	<code>\wedge</code>	<code>\mBb</code>	<code>\_u</code>	<code>\ppm</code>	<code>\sim</code>	<code>\R</code>		
⌚	<code>\bbb</code>	<code> </code>	<code>\C</code>	<code>\wedge</code>	<code>\mbB</code>	<code>\_v</code>	<code>\ppp</code>	<code>\sim</code>	<code>\r</code>		
⌚	<code>\BBm</code>	<code>  </code>	<code>\Cc</code>	<code>\_w</code>	<code>\mbb</code>	<code>:</code>	<code>\Ppp</code>	<code>\otimes</code>	<code>\T</code>		

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

TABLE 311: *metre* Small and Large Metrical Symbols

<code>\div</code>	<code>\anaclasis</code>	<code>\div</code>	<code>\Anaclasis</code>
<code>&lt;</code>	<code>\antidiple</code>	<code>&lt;</code>	<code>\Antidiple</code>
<code>&lt;</code>	<code>\antidiple*</code>	<code>&lt;</code>	<code>\Antidiple*</code>
<code>\circ</code>	<code>\antisigma</code>	<code>\circ</code>	<code>\Antisigma</code>
<code>\divideontimes</code>	<code>\asteriscus</code>	<code>\divideontimes</code>	<code>\Asteriscus</code>
<code>\wedge</code>	<code>\catalexis</code>	<code>\wedge</code>	<code>\Catalexis</code>
<code>\triangleright</code>	<code>\diple</code>	<code>\triangleright</code>	<code>\Diple</code>
<code>\divideontimes</code>	<code>\diple*</code>	<code>\divideontimes</code>	<code>\Diple*</code>
<code>\_—</code>	<code>\obelus</code>	<code>\_—</code>	<code>\Obelus</code>
<code>\div</code>	<code>\obelus*</code>	<code>\div</code>	<code>\Obelus*</code>
<code>\sim</code>	<code>\respondens</code>	<code>\sim</code>	<code>\Respondens</code>
<code>\otimes</code>	<code>\terminus</code>	<code>\otimes</code>	<code>\Terminus</code>
<code>\oplus</code>	<code>\terminus*</code>	<code>\oplus</code>	<code>\Terminus*</code>

TABLE 312: teubner Metrical Symbols

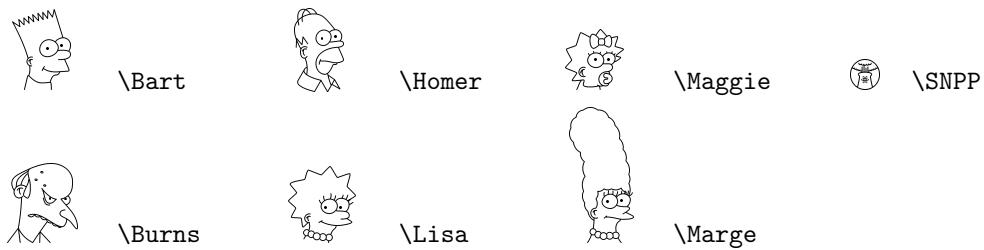
$\infty$	<code>\aeolicbii</code>	$\square$	<code>\barbrevis</code>	$^+$	<code>\ipercatal</code>
$\infty\infty$	<code>\aeolicbiii</code>	$\square\square$	<code>\bbrevis</code>	$-$	<code>\longa</code>
$\infty\infty\infty$	<code>\aeolicbiv</code>	$\square\square\square$	<code>\brevis</code>	$\underline{\square}$	<code>\ubarbbrevis</code>
$\times$	<code>\anceps</code>	$\wedge$	<code>\catal</code>	$\underline{\wedge}$	<code>\ubarbrevis</code>
$\times$	<code>\ancepsdbrevis</code>	$\cap$	<code>\corona</code>	$\underline{\wedge}\underline{\wedge}$	<code>\ubarsbrevis</code>
$\bar{x}$	<code>\banceps</code>	$\cup$	<code>\coronainv</code>	$\square$	<code>\ubrevislonga</code>
$\infty\infty$	<code>\barbbrevis</code>	$H$	<code>\hiatus</code>		

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

TABLE 313: dictsym Dictionary Symbols

$\ddagger$	<code>\dsaeronautical</code>	$\ddagger$	<code>\dscommercial</code>	$\ddagger$	<code>\dsmedical</code>
$\ddagger$	<code>\dsagricultural</code>	$\ddagger$	<code>\dsheraldical</code>	$\ddagger$	<code>\dsmilitary</code>
$\triangle$	<code>\dsarchitectural</code>	$\triangle$	<code>\dsjuridical</code>	$\triangle$	<code>\dsrailways</code>
$\ddagger$	<code>\dsbiological</code>	$\ddagger$	<code>\dsliterary</code>	$\ddagger$	<code>\dstechnical</code>
$\ddagger$	<code>\dschemical</code>	$\ddagger$	<code>\dsmathematical</code>		

TABLE 314: simpsons Characters from *The Simpsons*



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



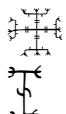
TABLE 315: pmboxdraw Box-Drawing Symbols

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

(continued on next page)

(continued from previous page)

	\staveX		\staveXXXIII		\staveLVI
	\staveXI		\staveXXXIV		\staveLVII
	\staveXII		\staveXXXV		\staveLVIII
	\staveXIII		\staveXXXVI		\staveLIX
	\staveXIV		\staveXXXVII		\staveLX
	\staveXV		\staveXXXVIII		\staveLXI
	\staveXVI		\staveXXXIX		\staveLXII
	\staveXVII		\staveXL		\staveLXIII
	\staveXVIII		\staveXLI		\staveLXIV
	\staveXIX		\staveXLII		\staveLXV
	\staveXX		\staveXLIII		\staveLXVI
	\staveXXI		\staveXLIV		\staveLXVII
	\staveXXII		\staveXLV		\staveLXVIII
	\staveXXIII		\staveXLVI		

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

TABLE 317: pigpen Cipher Symbols

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

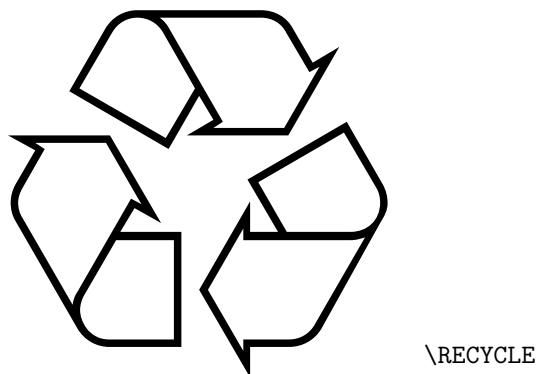
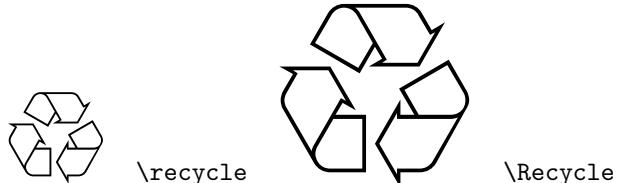
TABLE 318: GfNA2e Phases of the Moon

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

TABLE 319: Other  $\text{\texttt{G}}\text{\texttt{i}\texttt{A}2e}$  Symbols

	<code>\Greenpoint</code>		<code>\Postbox</code>		<code>\Telephone</code>
	<code>\Info</code>		<code>\Request</code>		

TABLE 320: `recycle` Recycling Symbols



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

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

## 8 Additional Information

Unlike the previous sections of this document, Section 8 does not contain new symbol tables. Rather, it provides additional help in using the Comprehensive L<sup>A</sup>T<sub>E</sub>X Symbol List. First, it draws attention to symbol names used by multiple packages. Next, it provides some guidelines for finding symbols and gives some examples regarding how to construct missing symbols out of existing ones. Then, it comments on the spacing surrounding symbols in math mode. After that, it presents an ASCII and Latin 1 quick-reference guide, showing how to enter all of the standard ASCII/Latin 1 symbols in L<sup>A</sup>T<sub>E</sub>X. And finally, it lists some statistics about this document itself.

### 8.1 Symbol Name Clashes

Unfortunately, a number of symbol names are not unique; they appear in more than one package. Depending on how the symbols are defined in each package, L<sup>A</sup>T<sub>E</sub>X will either output an error message or replace an earlier-defined symbol with a later-defined symbol. Table 321 on the following page presents a selection of name clashes that appear in this document.

Using multiple symbols with the same name in the same document—or even merely loading conflicting symbol packages—can be tricky but, as evidenced by the existence of Table 321, not impossible. The general procedure is to load the first package, rename the conflicting symbols, and then load the second package. Examine the L<sup>A</sup>T<sub>E</sub>X 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  $\mathcal{A}\mathcal{M}\mathcal{S}$  symbol sets, and L<sup>A</sup>T<sub>E</sub>X 2 <sub>$\varepsilon$</sub>  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 112 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 112 presents the symbols `\}` and `\uparrow` in their default size, in their `\big`, `\Big`, `\bigg`, and `\Bigg` sizes, in an even larger size achieved using `\left/\right`, and—for contrast—in a large size achieved by changing the font size using L<sup>A</sup>T<sub>E</sub>X 2 <sub>$\varepsilon$</sub> 's `\fontsize` command. Because the symbols shown belong to the Computer Modern family, the `type1cm` package needs to be loaded to support font sizes larger than 24.88 pt.

Note how `\fontsize` makes the symbol wider and thicker. (The `graphicx` package's `\scalebox` or `\resizebox` commands would produce a similar effect.) Also, the `\fontsize`-enlarged symbol is vertically centered relative to correspondingly large text, unlike the symbols enlarged using `\big` et al. or `\left/\right`, which all use the same math axis regardless of symbol size. However, `\fontsize` is not limited to mathematical delimiters. Also, `\scalebox` and `\resizebox` are more robust to poorly composed symbols (e.g., two symbols made to overlap by backspacing a fixed distance) but do not work with every T<sub>E</sub>X 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 112. The top, middle, and bottom segments are of a fixed size. The top-middle and middle-bottom segments (which are constrained to be the same character) are repeated as many times as necessary to achieve the desired height.

TABLE 321: Symbol Name Clashes

Symbol	$\text{\LaTeX}_2\mathcal{C}$	$\mathcal{AM}\mathcal{S}$	$\text{stmaryrd}$	$\text{wasy sym}$	$\text{mathabx}$	$\text{marvosym}$	$\text{bbding}$	$\text{ifsym}$	$\text{dingbat}$	$\text{wsipa}$
$\backslash\baro$				$\phi$						$\Theta$
$\backslash\bigtriangleleft$			$\triangleright$							
$\backslash\bigtriangleup$			$\triangle$							
$\backslash\checkmark$			$\checkmark$							
$\backslash\circleddash$					$\circ$					
$\backslash\cross$						$\dagger$		$\times$		
$\backslash\ggg$						$\bowtie$				
$\backslash\Letter$										
$\backslash\lightning$				$\not$						
$\backslash\Lightning$										
$\backslash\lll$						$\Downarrow$				
$\backslash\square$					$\square$					
$\backslash\Sun$						$\odot$				
$\backslash\TriangleDown$							$\blacktriangledown$			
$\backslash\TriangleUp$							$\blacktriangleup$		$\triangle$	

TABLE 322: Example of a Benign Name Clash

Symbol	Default (Computer Modern)	txfonts (Times Roman)
R	R	R
<code>\text{recipe}</code>	R	R

TABLE 323: Sample resized delimiters

Symbol	Default size	<code>\big</code>	<code>\Big</code>	<code>\bigg</code>	<code>\Bigg</code>	<code>\left/\right.</code>	<code>\fontsize</code>
<code>\}</code>	}	}	}	}	}	}	}

\uparrow      \uparrow      \uparrow      \uparrow      \uparrow      \uparrow      \uparrow      \uparrow

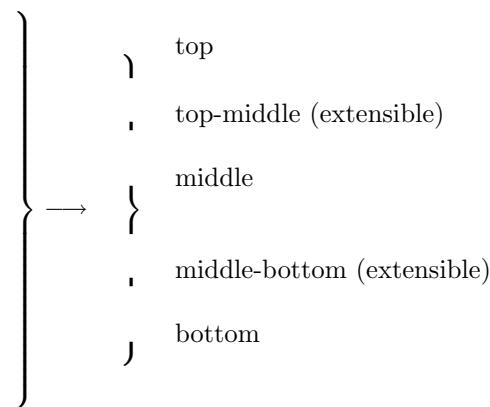


Figure 1: Implementation of variable-sized delimiters

### 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:

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

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

#### Reflecting and rotating existing symbols

A common request on `comp.text.tex` is for a reversed or rotated version of an existing symbol. As a last resort, these effects can be achieved with the `graphicx` (or `graphics`) package's `\reflectbox` and `\rotatebox` macros. For example, `\textsuperscript{\reflectbox{?}}` produces an irony mark (“`?`”; cf. [http://en.wikipedia.org/wiki/Irony\\_mark](http://en.wikipedia.org/wiki/Irony_mark)), and `\rotatebox[origin=c]{180}{\$\iotaota\$}` produces the definite-description operator (“`?`”). The disadvantage of the `graphicx/graphics` approach is that not every T<sub>E</sub>X backend handles graphical transformations.<sup>6</sup> 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` (“`3`”) or `wsipa`'s `\revepsilon` (“`3`”) may be used to express the mathematical notion of “such that” in a cleaner manner than with `\reflectbox` or `\rotatebox`.<sup>7</sup>

#### Joining and overlapping existing symbols

Symbols that do not exist in any font can sometimes be fabricated out of existing symbols. The L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> source file `fontdef.dtx` contains a number of such definitions. For example, `\models` (see Table 67 on page 34) is defined in that file with:

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

where `\mathrel` and `\joinrel` are used to control the horizontal spacing. `\def` is the T<sub>E</sub>X primitive upon which L<sup>A</sup>T<sub>E</sub>X's `\newcommand` is based. See The T<sub>E</sub>Xbook [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|}
```

<sup>5</sup>pifont defines a convenient `\Psymbol` command for accessing symbols in PostScript fonts by number. For example, “`\Psymbol{psy}{191}`” produces “`J`”.

<sup>6</sup>As an example, Xdvi ignores both `\reflectbox` and `\rotatebox`.

<sup>7</sup>More common symbols for representing “such that” include “`|`”, “`:`”, and “`s.t.`”.

In general, arrows/harpoons, horizontal lines (“=”, “\_”, “\relbar”, and “\Relbar”), and the various math-extension characters can be combined creatively with miscellaneous other characters to produce a variety of new symbols. Of course, new symbols can be composed from *any* set of existing characters. For instance, L<sup>A</sup>T<sub>E</sub>X defines \hbar (“ $\hbar$ ”) as a “-” character (\mathchar’26) followed by a backspace of 9 math units (\mkern-9mu), followed by the letter “*h*”:

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

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 “*b*” and “*d*”, respectively. Note that \dbar requires a greater backward math kern than \bbar; a -9 mu kern would have produced the less-attractive “*d*” glyph.

The amsmath package provides \overset and \underset commands for placing one symbol respectively above or below another. For example, \overset{G}{\sim}<sup>8</sup> produces “ $\overset{G}{\sim}$ ” (sometimes used for “equidecomposable with respect to *G*”).

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

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

Note how the space between columns (\tabcolsep) and rows (\vphantom{\bigg|}\vphantom{\bigg|}) is made negative to squeeze the asterisks closer together.

There is a T<sub>E</sub>X primitive called \mathaccent that centers one mathematical symbol atop another. For example, one can define \dotcup (“ $\cup$ ”)—the composition of a \cup and a \cdot—as follows:

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

The catch is that \mathaccent requires the accent to be a “math character”. That is, it must be a character in a math font as opposed to a symbol defined in terms of other symbols. See The T<sub>E</sub>Xbook [Knu86a] for more information.

Another T<sub>E</sub>X primitive that is useful for composing symbols is \vcenter. \vcenter is conceptually similar to “\begin{tabular}{l}” in L<sup>A</sup>T<sub>E</sub>X 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 (“ $\sim$ ”) symbols with 0.35 *x*-heights of space between them, is rendered as “ $\approx$ ”. \offinterlineskip is a macro that disables implicit interline spacing. Without it, \threesim would have a full line of vertical spacing between each \sim. Because of \vcenter, \threesim aligns properly with other math operators:  $a \div b \approx c \times d$ .

---

<sup>8</sup>L<sup>A</sup>T<sub>E</sub>X’s \stackrel command is similar but is limited to placing a symbol above a binary relation.

A related L<sup>A</sup>T<sub>E</sub>X command, borrowed from Plain T<sub>E</sub>X, 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 T<sub>E</sub>X’s `\ialign` primitive, `\ooalign` uses T<sub>E</sub>X’s tabular syntax instead of L<sup>A</sup>T<sub>E</sub>X’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`, “ $\circledcirc$ ”) as a superscripted Plimsoll line (`\barcirc`, “ $\circ$ ”),<sup>9</sup> is due to an October 2007 `comp.text.tex` post by Donald Arseneau:

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

In the preceding code, note the `\ooalign` call’s use of `\hfil` to horizontally center a minus sign (“ $-$ ”) and a `\circ` (“ $\circ$ ”).

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` (“ $\ni$ ”) and two minus signs (“ $-$ ”) to produce “ $\ni$ ”, an obscure variation on the infrequently used “ $\exists$ ” symbol for “such that” discussed on page 113:

```
\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 “ $\overline{D}$ ”. However, the `\declarelashed` command provides the flexibility to specify the mathematical context of the composite character (operator, relation, punctuation, etc., as will be discussed in Section 8.4), the overlapping symbol, horizontal and vertical adjustments in symbol-relative units, and the character to be overlapped. Consider, for example, the symbol for reduced quadrupole moment (“ $I$ ”). This can be declared as follows:

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

`\declarelashed{\cdot}{\cdot}{\cdot}{I}` affects the meaning of all subsequent `\slashed{I}` commands in the same scope. The preceding definition of `\rqm` therefore uses an extra set of curly braces to limit that scope to a single `\slashed{I}`. In addition, `\rqm` uses `amstext`’s `\text` macro (described on page 117) to make `\declarelashed` 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 `\declarelashed` commands.

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

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

See the `centernot` documentation for more information.

---

<sup>9</sup>While `\barcirc` illustrates how to combine symbols using `\ooalign`, the `stmaryrd` package’s `\minuso` command (Table 46 on page 25) provides a similar glyph (“ $\circ$ ”) as a single, indivisible symbol.

## Making new symbols work in superscripts and subscripts

To make composite symbols work properly within subscripts and superscripts, you may need to use TeX's `\mathchoice` primitive. `\mathchoice` evaluates one of four expressions, based on whether the current math style is display, text, script, or scriptscript. (See The TeXbook [Knu86a] for a more complete description.) For example, the following L<sup>A</sup>T<sub>E</sub>X code—posted to `comp.text.tex` by Torsten Bronger—composes a sub/superscriptable “ $\top$ ” symbol out of `\top` and `\bot` (“ $\top$ ” and “ $\bot$ ”):

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

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

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

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

L<sup>A</sup>T<sub>E</sub>X 2 <sub>$\varepsilon$</sub>  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 on the following page.

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

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

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

Sometimes, however, `amstext`’s `\text` macro is all that is necessary to make composite symbols appear correctly in subscripts and superscripts, as in the following definitions of `\neswarrown` (“↗”) and `\nwsearrow` (“↖”):<sup>10</sup>

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

`\text` resembles L<sup>A</sup>T<sub>E</sub>X’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 “B”. However, the result of the former is the width of “A”, and the result of the latter is the width of “B”—`\llap{...}` and `\rlap{...}` take up zero space.

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

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

The `\makeatletter` and `\makeatother` commands are needed to coerce L<sup>A</sup>T<sub>E</sub>X into accepting “@” as part of a macro name. `\moverlay` takes a list of symbols separated by `\cr` (TeX’s equivalent of L<sup>A</sup>T<sub>E</sub>X’s `\backslash`). For example, the `\topbot` command defined on the previous page could have been expressed as “`\moverlay{\top\cr\bot}`” and the `\neswarrown` command defined above could have been expressed as “`\moverlay{\nearrow\cr\swarrow}`”.

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

## Modifying L<sup>A</sup>T<sub>E</sub>X-generated symbols

Oftentimes, symbols composed in the L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> 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 70) out of three periods, raised 7 pt., 4 pt., and 1 pt., respectively:

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

`\p@` is a L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> 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.

---

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

## Producing complex accents

Accents are a special case of combining existing symbols to make new symbols. While various tables in this document show how to add an accent to an existing symbol, some applications, such as transliterations from non-Latin alphabets, require *multiple* accents per character. For instance, the creator of pdfTEX writes his name as “Hàn Thé Thành”. The dblaccnt package enables L<sup>A</sup>T<sub>E</sub>X to stack accents, as in “H\‘an Th\‘{ \^e} Th\‘anh” (albeit not in the OT1 font encoding). In addition, the wsipa package defines \diatop and \diaunder macros for putting one or more diacritics or accents above or below a given character. For example, \diaunder[{\diatop[\']|\=}{\textsubdot{r}}] produces “̄”. See the wsipa documentation for more information.

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

## Creating extensible symbols

A relatively simple example of creating extensible symbols stems from a comp.text.tex post by Donald Arseneau (June 2003). The following code defines an equals sign that extends as far to the right as possible, just like L<sup>A</sup>T<sub>E</sub>X’s \hrulefill command:

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

T<sub>E</sub>X’s \cleaders and \hfill primitives are the key to understanding \equalsfill’s extensibility. Essentially, \equalsfill repeats a box containing “=” plus some negative space until it fills the maximum available horizontal space. \equalsfill is intended to be used with L<sup>A</sup>T<sub>E</sub>X’s \stackrel command, which stacks one mathematical expression (slightly reduced in size) atop another. Hence, “\stackrel{a}{\rightarrow}” produces “ $\xrightarrow{a}$ ” and “X \stackrel{\text{definition}}{\hbox{\equalsfill}} Y” produces “ $X \overset{\text{definition}}{=}= Y$ ”.

If all that needs to extend are horizontal and vertical lines—as opposed to repeated symbols such as the “=” in the previous example—L<sup>A</sup>T<sub>E</sub>X’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\braceleft\leaders\vrule\hfill\braceright$}
\def\upparenthfill{$\m@th\bracel\leaders\vrule\hfill\braceru$}
\def\upbracketfill{$\m@th\makesm@sh{\llap{\vrule\@height3\p@\@width.7\p@}}\%
    \leaders\vrule\@height.7\p@\hfill
    \makesm@sh{\rlap{\vrule\@height3\p@\@width.7\p@}}$}
\def\downbracketfill{$\m@th
    \makesm@sh{\llap{\vrule\@height.7\p@\@depth2.3\p@\@width.7\p@}}\%
    \leaders\vrule\@height.7\p@\hfill
    \makesm@sh{\rlap{\vrule\@height.7\p@\@depth2.3\p@\@width.7\p@}}$}
\makeatother

```

Table 324 showcases these accents. The TEXbook [Knu86a] or another book on TEX primitives is indispensable for understanding how the preceding code works. The basic idea is that `\downparenthfill`, `\upparenthfill`, `\downbracketfill`, and `\upbracketfill` do all of the work; they output a left symbol (e.g., `\braceleft` [“ $\smash{\overbrace{}}_{\smash{\overbrace{}}}$ ”] for `\downparenthfill`), a horizontal rule that stretches as wide as possible, and a right symbol (e.g., `\braceright` [“ $\smash{\overbrace{}}^{\smash{\overbrace{}}}$ ”] 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

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

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



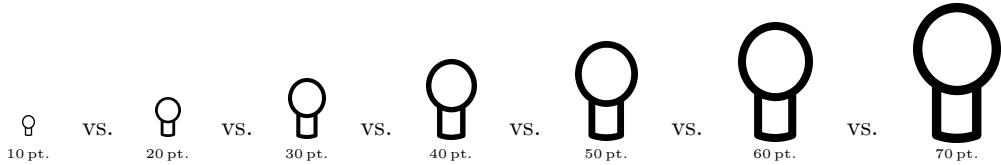
See the `simplewick` documentation for more information.

### Developing new symbols from scratch

Sometimes it 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 L<sup>A</sup>T<sub>E</sub>X-specific operations not mentioned in The METAFONTbook and to demonstrate that symbol-font creation is not necessarily a difficult task.

Suppose we need a symbol to represent a light bulb (“Q”).<sup>11</sup> 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:



```

font_identifier := "LightBulb10";                                % Name the font.
font_size 10pt#;                                                 % Specify the design size.
em# := 10pt#;                                                   % "M" width is 10 points.
cap# := 7pt#;                                                   % Capital letter height is 7 points above the baseline.
sb# := 1/4pt#;                                                 % Leave this much space on the side of each character.
o# := 1/16pt#;                                                 % Amount that curves overshoot borders.
input lightbulb                                              % Load the file that draws the actual glyph.

```

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

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

The code in Figures 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.

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

```

prompt> mf lightbulb10.mf                                     <= Produces lightbulb10.2602gf
prompt> gftodvi lightbulb10.2602gf                           <= Produces lightbulb10.dvi

```

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

Most, if not all, T<sub>E</sub>X distributions include a Plain T<sub>E</sub>X 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

```

<sup>11</sup>I’m not a very good artist; you’ll have to pretend that “Q” looks like a light bulb.

```

mode_setup;                                     % Target a given printer.

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

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

  %% Define the points we need.
  top z1 = (w/2, h + o);                   %  $z_1$  is at the top of a circle.
  rt z2 = (w + sb + o - x4, y4);          %  $z_2$  is at the same height as  $z_4$  but the opposite side.
  bot z3 = (z1 - (0, w - sb - o));         %  $z_3$  is at the bottom of the circle.
  lft z4 = (sb - o, 1/2[y1, y3]);          %  $z_4$  is on the left of the circle.
  path bulb;                                % Define a path for the bulb itself.
  bulb = z1 .. z2 .. z3 .. z4 .. cycle;    % The bulb is a closed path.

  z5 = point 2 - 1/3 of bulb;               %  $z_5$  lies on the bulb, a little to the right of  $z_3$ .
  z6 = (x5, 0);                            %  $z_6$  is at the bottom, directly under  $z_5$ .
  z7 = (x8, 0);                            %  $z_7$  is at the bottom, directly under  $z_8$ .
  z8 = point 2 + 1/3 of bulb;               %  $z_8$  lies on the bulb, a little to the left of  $z_3$ .
  bot z67 = (1/2[x6, x7], pen_bot - o - 1/8pt); %  $z_{67}$  lies halfway between  $z_6$  and  $z_7$  but a jot lower.

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

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

endchar;
end

```

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

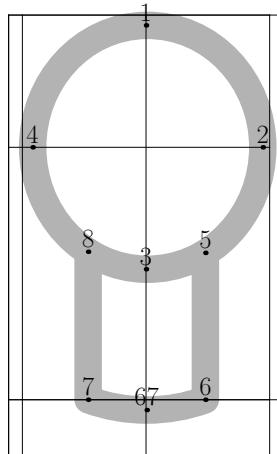


Figure 4: Proof diagram of `lightbulb10.mf`

```

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 figure shows a font table generated by `testfont.tex`. The title of the table is "Test of lightbulb10 on March 11, 2003 at 1127". The table has two rows of headers: the first row contains character codes '0' through '7' and the second row contains their corresponding symbols. The first row is labeled with '10x' and the second with '11x'. The second row is labeled with "'4x". The table is as follows:

	'0	'1	'2	'3	'4	'5	'6	'7	
'10x		Ω							"4x
'11x	"8	"9	"A	"B	"C	"D	"E	"F	

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

The LightBulb10 font is now usable by  $\text{\TeX}$ .  $\text{\LaTeX} 2_{\varepsilon}$ , however, needs more information before documents can use the font. First, we create a font-description file that tells  $\text{\LaTeX} 2_{\varepsilon}$  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 “ $\text{\LaTeX} 2_{\varepsilon}$  Font Selection” [ET00] 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  $\text{\LaTeX} 2_{\varepsilon}$  request for a U-encoded version of `bulb` with a (m)edium font series (as opposed to, e.g., bold) and a (n)ormal font shape (as opposed to, e.g., italic) should translate into a  $\text{\TeX}$  request for `lightbulb10.tfm` mechanically scaled to the current font size.

```

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

```

Figure 6:  $\text{\LaTeX} 2_{\varepsilon}$  font-description file (`ubulb.fd`)

The final step is to write a  $\text{\LaTeX} 2_{\varepsilon}$  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.

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

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

Figure 7: L<sup>A</sup>T<sub>E</sub>X 2 <sub>$\varepsilon$</sub>  style file (`lightbulb.sty`)

<http://www.tex.ac.uk/cgi-bin/texfaq2html?label=textrace> for pointers to tools that can produce Type 1 fonts from METAFONT.

## 8.4 Math-mode spacing

Terms such as “binary operators”, “relations”, and “punctuation” in Section 3 primarily regard the surrounding spacing. (See the Short Math Guide for L<sup>A</sup>T<sub>E</sub>X [Dow00] for a nice exposition on the subject.) To use a symbol for a different purpose, you can use the T<sub>E</sub>X commands `\mathord`, `\mathop`, `\mathbin`, `\mathrel`, `\mathopen`, `\mathclose`, and `\mathpunct`. For example, if you want to use `\downarrow` as a variable (an “ordinary” symbol) instead of a delimiter, you can write `“$3 x + \mathord{\downarrow}$”` to get the properly spaced “ $3x+\downarrow$ ” rather than the awkward-looking “ $3x+\downarrow$ ”. Similarly, to create a dotted-union symbol (“ $\dot{\cup}$ ”) that spaces like the ordinary set-union symbol (`\cup`) it must be defined with `\mathbin`, just as `\cup` is. Contrast `“$A \dot{\cup} B$”` (“ $A \dot{\cup} B$ ”) with `“$A \mathbin{\dot{\cup}} B$”` (“ $A \dot{\cup} B$ ”). See The T<sub>E</sub>Xbook [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 contrasts the output of the log-like symbols with various, naïve alternatives. In addition to spacing, the log-like symbols also handle subscripts properly. For example, `“\max_{p \in P}”` produces “ $\max_{p \in P}$ ” in text, but “ $\max$ ” as part of a displayed formula.

TABLE 325: Spacing Around/Within Log-like Symbols

L <sup>A</sup> T <sub>E</sub> X expression	Output
<code>\$r \sin \theta\$</code>	$r \sin \theta$ (best)
<code>\$r sin \theta\$</code>	$rsin\theta$
<code>\$r \mbox{sin} \theta\$</code>	$rsin\theta$
<code>\$r \mathrm{sin} \theta\$</code>	$rsin\theta$

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

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

The difference between `\DeclareMathOperator` and `\DeclareMathOperator*` involves the handling of subscripts. With `\DeclareMathOperator*`, subscripts are written beneath log-like symbols in display style and to the right in text style. This is useful for limit operators (e.g., `\lim`) and functions that tend to map over a set (e.g., `\min`). In contrast, `\DeclareMathOperator` tells T<sub>E</sub>X 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 (`(\(...\))`).<sup>12</sup>

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

## 8.5 Bold mathematical symbols

L<sup>A</sup>T<sub>E</sub>X 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/>

<sup>12</sup>Note that `\displaystyle` can be used to force display style within `$(...)$` and `\textstyle` can be used to force text style within `(\(...\))`.

TABLE 326: Defining new log-like symbols

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

`texfaq2html?label=boldgreek` can be used to produce bold mathematical symbols. Table 327 contrasts the output produced by these various techniques. As the table illustrates, these techniques exhibit variation in their formatting of Latin letters (upright vs. italic), formatting of Greek letters (bold vs. normal), formatting of operators and relations (bold vs. normal), and spacing.

TABLE 327: Producing bold mathematical symbols

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

## 8.6 ASCII and Latin 1 quick reference

Table 328 on the next page amalgamates data from various other tables in this document into a convenient reference for L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> typesetting of ASCII characters, i.e., the characters available on a typical U.S. computer keyboard. The first two columns list the character's ASCII code in decimal and hexadecimal. The third column shows what the character looks like. The fourth column lists the L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> command to typeset the character as a text character. And the fourth column lists the L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> command to typeset the character within a `\textttt{...}` command (or, more generally, when `\ttfamily` is in effect).

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

- “!” is not available in the OT1 font encoding.
- Table 328 shows a close quote for character 39 for consistency with the open quote shown for character 96. A straight quote can be typeset using `\textquotesingle` (cf. Table 40).
- The characters “<”, “>”, and “|” do work as expected in math mode, although they produce, respectively, “ $\langle$ ”, “ $\rangle$ ”, and “ $\mid$ ” in text mode when using the OT1 font encoding.<sup>13</sup> The following are some alternatives for typesetting “<”, “>”, and “|”:
  - Specify a document font encoding other than OT1 (as described on page 9).
  - Use the appropriate symbol commands from Table 2 on page 10, viz. `\textless`, `\textgreater`, and `\textbar`.
  - Enter the symbols in math mode instead of text mode, i.e., `$<$`, `$>$`, and `$\mid$`.

Note that for typesetting metavariables many people prefer `\textlangle` and `\textrangle` to `\textless` and `\textgreater`; i.e., “`\langle filename \rangle`” instead of “`<filename>`”.

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

TABLE 328: L<sup>A</sup>T<sub>E</sub>X 2 <sub>$\varepsilon$</sub>  ASCII Table

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

- Although “/” does not require any special treatment, L<sup>A</sup>T<sub>E</sub>X 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 34), which produces a somewhat wide “~”, or the textcomp package’s \texttildelow (shown in Table 40 on page 22), which produces a vertically centered “~” in most fonts but a baseline-oriented “~” in Computer Modern, txfonts, pxfonts, and various other fonts originating from the T<sub>E</sub>X 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{\\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 81.
- 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 16 plus an empty argument. For instance, `\={}` is essentially the same as `\textasciimacron`.
- The commands in the “ $\text{\LaTeX} 2_{\varepsilon}$ ” 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  $\text{\LaTeX}$ ’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 9) 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`.

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

## 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  $\text{\TeX}$  and  $\text{\LaTeX}$  predate the Unicode standard and Unicode fonts by almost a decade, support for Unicode has had to be added to the base  $\text{\TeX}$  and  $\text{\LaTeX}$  systems. Note first that  $\text{\LaTeX}$  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.

---

<sup>14</sup>`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.

TABLE 329: LATEX 2 $\varepsilon$  Latin 1 Table

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

TABLE 330: L<sup>A</sup>T<sub>E</sub>X 2 <sub>$\varepsilon$</sub>  Code Page 1252 Table

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

### 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.<sup>15</sup> These packages enable L<sup>A</sup>T<sub>E</sub>X to translate UTF-8 sequences to L<sup>A</sup>T<sub>E</sub>X commands, which are subsequently processed as normal. For example, the UTF-8 text “Copyright © 2009”—“©” is not an ASCII character and therefore cannot be input directly without packages such as `ucs`/`inputenc`—is converted internally by `inputenc` to “Copyright \textcopyright{} 2009” and therefore typeset as “Copyright © 2009”.

The `ucs`/`inputenc` combination supports only a tiny subset of Unicode’s million-plus symbols. Additional symbols can be added manually using the `\DeclareUnicodeCharacter` command. `\DeclareUnicodeCharacter` takes two arguments: a Unicode number and a L<sup>A</sup>T<sub>E</sub>X command to execute when the corresponding Unicode character is encountered in the input. For example, the Unicode character “degree celsius” (“°C”) appears at character position U+2103.<sup>16</sup> However, “°C” is not one of the characters that `ucs` and `inputenc` recognize. The following document shows how to use `\DeclareUnicodeCharacter` to tell L<sup>A</sup>T<sub>E</sub>X that the “°C” character should be treated as a synonym for `\textcelsius`:

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

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

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

which produces

It was a balmy 21°C.

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

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

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

## Outputting Unicode characters

Orthogonal to the ability to include Unicode characters in a L<sup>A</sup>T<sub>E</sub>X input file is the ability to include a given Unicode character in the corresponding output file. By far the easiest approach is to use X<sub>E</sub>L<sup>A</sup>T<sub>E</sub>X instead of pdfL<sup>A</sup>T<sub>E</sub>X or ordinary L<sup>A</sup>T<sub>E</sub>X. X<sub>E</sub>L<sup>A</sup>T<sub>E</sub>X 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 X<sub>E</sub>L<sup>A</sup>T<sub>E</sub>X document can either include that character directly as UTF-8 text or use T<sub>E</sub>X's `\char` primitive, which X<sub>E</sub>L<sup>A</sup>T<sub>E</sub>X extends to accept numbers larger than 255.

Suppose we want to output the symbols for versicle (“ $\text{V}$ ”) and response (“ $\text{R}$ ”) in a document. The Unicode charts list “versicle” at position U+2123 and “response” at position U+211F. We therefore need to install a font that contains those characters at their proper positions. One such font that is freely available from CTAN is Junicode Regular (`Junicode-Regular.ttf`) from the junicode package. The `fontspec` package makes it easy for a X<sub>E</sub>L<sup>A</sup>T<sub>E</sub>X 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 “ $\text{V}$ ” for a versicle and “ $\text{R}$ ” for a response.

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

## 8.8 About this document

**History** David Carlisle wrote the first version of this document in October, 1994. It originally contained all of the native L<sup>A</sup>T<sub>E</sub>X 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 *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 L<sup>A</sup>T<sub>E</sub>X Symbol List”, includes the following new features:

- the addition of a handful of new math alphabets, dozens of new font tables, and thousands of new symbols
- the categorization of the symbol tables into body-text symbols, mathematical symbols, science and technology symbols, dingbats, ancient languages, and other symbols, to provide a more user-friendly document structure
- an index, table of contents, hyperlinks, and a frequently-requested symbol list, to help users quickly locate symbols

- symbol tables rewritten to list the symbols in alphabetical order
- appendices providing additional information relevant to using symbols in L<sup>A</sup>T<sub>E</sub>X
- tables showing how to typeset all of the characters in the ASCII and Latin 1 font encodings

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

**Build characteristics** Table 331 lists some of this document's build characteristics. Most important is the list of packages that L<sup>A</sup>T<sub>E</sub>X couldn't find, but that `symbols.tex` otherwise would have been able to take advantage of. Complete, prebuilt versions of this document are available from CTAN (<http://www.ctan.org/> or one of its many mirror sites) in the directory `tex-archive/info/symbols/comprehensive`. Table 332 shows the package date (specified in the `.sty` file with `\ProvidesPackage`) for each package that was used to build this document and that specifies a package date. Packages are not listed in any particular order in either Table 331 or Table 332.

TABLE 331: Document Characteristics

Characteristic	Value
Source file:	<code>symbols.tex</code>
Build date:	November 9, 2009
Symbols documented:	5913
Packages included:	textcomp latexsym amssymb stmaryrd euscript wasysym pifont manfnt bbding undertilde ifsym tipa extraipa wsipa phonetic uly ar metre txfonts mathabx fclfont skak ascii dingbat skull eurosym esvect yfants yhmath esint mathdots trsym universa upgreek overrightarrow chemarr chemarrow nath trfsigns mathtools phaistos arcs vietnam t4phonet holtpolt semtrans dictsym extarrows protosem harmony hieroglif cclibraries mathdesign arev MnSymbol cmll extpfeil keystroke fge turnstile simpsons epsdice feyn universal staves igo colonequals shuffle fourier dozenal pmboxdraw pigpen clock teubner linearA linearb cyprriot sarabian china2e harpoon steinmetz milstd recycle DotArrow ushort hhcount ogonek combelow accents nicefrac bm mathrsfs chancery calligra bbold mbboard dsfont bbm
Packages omitted:	<i>none</i>

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

Name	Date
textcomp	2005/09/27
latexsym	1998/08/17
amssymb	2002/01/22
stmaryrd	1994/03/03
euscript	2001/10/01
wasymp	2003/10/30
pifont	2005/04/12
manfnt	1999/07/01

(continued on next page)

(continued from previous page)

Name	Date
bding	1999/04/15
undertilde	2000/08/08
ifsym	2000/04/18
tipa	2002/08/08
tipx	2003/01/01
wsuipa	1994/07/16
metre	2001/12/05
txfonts	2008/01/22
mathabx	2003/07/29
skak	2008/10/09
ascii	2006/05/30
dingbat	2001/04/27
skull	2002/01/23
eurosym	1998/08/06
yfonts	2003/01/08
mathdots	2006/03/16
trsym	2000/06/25
universa	98/08/01
upgreek	2003/02/12
chemarr	2006/02/20
mathtools	2008/08/01
phaistos	2004/04/23
arcs	2004/05/09
t4phonet	2004/06/01
semtrans	1998/02/10
dictsym	2004/07/26
extarrows	2008/05/15
protosem	2005/03/18
harmony	2007/05/03
hierogl	2000/09/23
cclibraries	2005/05/20
arev	2005/06/14
MnSymbol	2007/01/21
extpfeil	2006/07/27
keystroke	2003/08/15
fge	2007/06/03
turnstile	2007/06/23
epsdice	2007/02/15
feyn	2008/02/29
universal	97/12/24
colonequals	2006/08/01
shuffle	2008/10/27
pmbboxdraw	2006/05/03
pigpen	2008/12/07
clock	2001/04/10
teubner	2008/02/10
linearA	2006/03/13
linearb	2005/06/22

(continued on next page)

*(continued from previous page)*

Name	Date
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 L<sup>A</sup>T<sub>E</sub>X Symbol List  
Copyright © 2009, Scott Pakin

This work may be distributed and/or modified under the conditions of the L<sup>A</sup>T<sub>E</sub>X Project Public License, either version 1.3c of this license or (at your option) any later version. The latest version of this license is in

<http://www.latex-project.org/lppl.txt>

and version 1.3c or later is part of all distributions of L<sup>A</sup>T<sub>E</sub>X version 2006/05/20 or later.

This work has the LPPL maintenance status “maintained”.

The current maintainer of this work is Scott Pakin.

## References

- [AMS99] American Mathematical Society. *User’s Guide for the amsmath Package (Version 2.0)*, December 13, 1999. Available from <ftp://ftp.ams.org/pub/tex/doc/amsmath/amsldoc.pdf>.
- [Ber01] Karl Berry. Fontname: Filenames for T<sub>E</sub>X fonts, June 2001. Available from <http://www.ctan.org/tex-archive/info/fontname>.
- [Che97] Raymond Chen. A METAFONT of ‘Simpsons’ characters. *Baskerville*, 4(4):19, September 1997. ISSN 1354-5930. Available from [http://tug.ctan.org/usergrps/uktug/baskervi/4\\_4/bask4\\_4.ps](http://tug.ctan.org/usergrps/uktug/baskervi/4_4/bask4_4.ps).
- [Dow00] Michael Downes. Short math guide for L<sub>A</sub>T<sub>E</sub>X, July 19, 2000. Version 1.07. Available from <http://www.ams.org/tex/short-math-guide.html>.
- [Gib97] Jeremy Gibbons. Hey—it works! *TUGboat*, 18(2):75–78, June 1997. Available from <http://www.tug.org/TUGboat/Articles/tb18-2/tb55works.pdf>.
- [Knu86a] Donald E. Knuth. *The T<sub>E</sub>Xbook*, volume A of *Computers and Typesetting*. Addison-Wesley, Reading, MA, USA, 1986.
- [Knu86b] Donald E. Knuth. *The METAFONTbook*, volume C of *Computers and Typesetting*. Addison-Wesley, Reading, MA, USA, 1986.
- [Lam86] Leslie Lamport. *L<sub>A</sub>T<sub>E</sub>X: A document preparation system*. Addison-Wesley, Reading, MA, USA, 1986.
- [LAT98] L<sub>A</sub>T<sub>E</sub>X3 Project Team. A new math accent. *L<sub>A</sub>T<sub>E</sub>X News*. Issue 9, June 1998. Available from <http://www.ctan.org/tex-archive/macros/latex/doc/ltnews09.pdf> (also included in many T<sub>E</sub>X distributions).
- [LAT00] L<sub>A</sub>T<sub>E</sub>X3 Project Team. L<sub>A</sub>T<sub>E</sub>X 2<sub>ε</sub> font selection, January 30, 2000. Available from <http://www.ctan.org/tex-archive/macros/latex/doc/fntguide.ps> (also included in many T<sub>E</sub>X 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., “ˇ” for “\v”).

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

Symbols	
\\" (ˇ)	16
\# (#)	10, 125
\\$ (\$)	10, 125
\% (%)	10, 125
\& (&)	10, 125
\' (ˇ)	16
( (()	61
( ( (	62
) ()	61
) ( )	62
* (*)	26
\,	123
\- (-)	126, 127
\. (ˇ)	16
\/ (/)	61
\/ ( /)	62
\: (:)	72
\; (:)	72
< ( (	62
\? ( ?)	72
[ ( [)	61
[ ( [ ])	63
\\\ [ ]	115
] ( ])	61
] ( [ ])	63
\^ (ˇ)	16
\^{\} } (^)	10, 125
\  (   )	61
\  (    )	61, 63
\  ( \ )	16
\= ( =)	16
\= {\} } (^)	126
\  (   )	63
\  (   )	34, 61, 63, 64
\_ (-)	10, 125
\{ ( {)	10, 61, 125
\} ( )	10, 61, 125
\` (ˇ)	16
\~ (ˇ)	16
\~ {\} } (^)	10, 125

A	
a (esvect package option)	68
\a (x)	105
\AA (Å)	11
\aa (å)	11
\AAaleph (א)	91
\AAayin (ׁ)	91
\AAbeth (ׂ)	91
\AAcht (׃)	99
\AAdaleth (א)	91
\AAhe (ׁ)	91
\AAhelmet (ׂ)	91
\AAheth (ׂ)	91
\AAkaph (ׁ)	91
\AAlamed (ׁ)	91
\AAleph (ׁ)	91
\AApe (ׁ)	91
\AAqoph (ׁ)	91
\AAresh (ׁ)	91
\AAAsade (ׁ)	91
\Ayain (ׁ)	91
\AAyod (ׁ)	91
\Abeth (ׁ)	91
absolute value	see \lvert and \rvert
abzüglich	see \textdiscount
\AC (~)	78
\acarc	18
\acbar	18
accents	16–20, 65–68, 80, 99, 118–119
acute (ˇ)	16–18, 20, 65
any character as	118
arc (ˇ)	16–19, 66–68
breve (ˇ)	16–18, 20, 65
caron (ˇ)	16, 20, 65, 67
cedilla (ˇ)	16
circumflex (ˇ)	16–17, 65–67
comma-below (ˇ)	19
diæresis (ˇ)	16, 18, 20, 65, 77
dot (ˇ or ˘)	16–17, 65
double acute (ˇ)	16, 20
extensible	66–68, 70, 118–119
grave (ˇ)	16–18, 20, 65
háček	see accents, caron
hook (ˇ)	16
Hungarian umlaut	see accents, double acute
kroužek	see accents, ring
macron (ˇ)	16, 18, 20, 65–67

multiple per character	16–17, 118
ogonek (ˇ)	16–19
ring (ˇ)	16–17, 20, 65, 66
Romanian comma-belo accent	see accents, comma-below
trema	see accents, diæresis
umlaut	see accents, diæresis
accents (package)	65, 118, 130, 132
\accentset	118
\Acht (׃)	99
\AchtBL (׃)	99
\AchtBR (׃)	99
\ACK (ׁ)	81
\acontraction	119
\AcPa (ׁ)	99
\actuarial (ˇ)	118
actuarial symbols	118
\acute (ˇ)	65
acute (ˇ)	see accents
\actus (ˇ)	18
\Adaleth (ׁ)	91
adeles (ׁ)	see alphabets, math
adjoint (†)	see \dag
Adobe Acrobat	122
\adots (..)	71, 117
advancing	see \textadvancing
\AE (Æ)	11
\ae (æ)	11
\aeolicbii (oo)	106
\aeolicbii (ooo)	106
\aeolicbiv (oooo)	106
\agemO (ׁ)	73
\Agimel (ׁ)	91
\Ahe (ׁ)	91
\Ahelmet (ׂ)	91
\Aheth (ׂ)	91
\ain (ׁ)	20
\Akaph (ׁ)	91
\Alad (ׁ)	65
\alad (ׁ)	65
\Alamed (ׁ)	91
\Alas (ׁ)	65
\alas (ׁ)	65
\aldine (ׁ)	88
\aldineleft (ׁ)	88
\aldineright (ׁ)	88
\aldinesmall (ׁ)	88

<sup>17</sup>This occurs frequently between `amssymb` and `mathabx`, for example.

\aleph (ℵ)	58, 73
\aleph (ℵ)	58
\Alif (߁)	15
\alpha (α)	57
alphabets	
African	11
Cypriot	96
Cyrillic	113
Greek	57, 58, 76, 97
Hebrew	58, 76
hieroglyphic	92
Linear A	92
Linear B	95
math	76
phonetic	12–15
proto-Semitic	91
South Arabian	97
Vietnamese	11
\alphaup (α)	57
alpine symbols	102
\Alt (Alt)	80
alternative denial	see \uparrow
and	
\AltGr (AltGr)	80
\amalg (II)	24
\amalg (U)	26
\Amem (ׁׂ)	91
ampersand	see \&
\AMS	9, 11, 24, 29, 34, 41, 43, 46, 48, 56–61, 65, 67, 68, 71, 73, 77, 110, 129
amsbsy (package)	124
amsfonts (package)	24, 34, 41, 47, 73, 76
amsmath (package)	9, 56, 65, 114, 123
amssymb (package)	9, 24, 34, 41, 47, 65, 73, 76, 97, 130, 134
amstext (package)	115, 117
\Anaclasis (÷)	105
\anaclasis (÷)	105
\anceps (×)	106
\ancepsdbrevi (❀)	106
\anchor (Ĵ)	90
ancient-language symbols	91–97
and	see \wedge
AND gates	81
	81
\ANDd (	81
	81
\ANDl (	81
	81
\ANDr (	81
	81
\ANDu (	81
\angle (∠)	73
\angle (∠)	73
\angle (∠)	74
angle notation	79
angles	73–75
\AngleSign (⦿)	74
Ångström unit	
math mode	see \mathring{A}
text mode	see \AA
\Angud (܊)	65
\angud (܊)	65
angular minutes	see \prime
angular seconds	see \second
\Angus (܊)	65
\angus (܊)	65
animals	91, 92, 96
\Ankh (†)	101
annuity symbols	118
\Antidiple (<)	105
\antidiple (<)	105
\Antidiple* (<)	105
\antidiple* (<)	105
\antilabe (:)	72
\Antisigma (܊)	105
\antisigma (܊)	105
\Anun (܊)	91
\Ape (܊)	91
APL	
modifiers	80
symbols	80
\APLbox (□)	80
\APLcirc (■)	80
\APLcomment (܊)	80
\APLdown (▽)	80
\APLdownarrowbox (⤒)	80
\APLinput (□)	80
\APLinv (⤓)	80
\APLleftarrowbox (⤑)	80
\APLlog (⊗)	80
\APLminus (⊖)	80
\APLnot (܊)	80
\APLrightarrowbox (⤒)	80
\APLstar (★)	80
\APLup (△)	80
\APLuparrowbox (⤑)	80
\APLvert (܊)	80
\apprge (⩾)	43
\apprle (⩷)	43
\approx (≈)	34
\approx (≈)	36
\approxcolon (≈:)	41
\approxcoloncolon (≈::)	41
\approxeq (⩵)	34
\approxeq (⩵)	36
\approxeq (⩵)	36
\Aqoph (܊)	91
\Aquarius (܊)	79
\aquarius (܊)	79
\AR (܊)	78
ar (package)	78, 130
arc (܊)	see accents
\arccos (arccos)	56
arcminutes	see \prime
arcs (package)	19, 130, 131
arcseconds	see \second
\arcsin (arcsin)	56
\arctan (arctan)	56
\Aresh (܊)	91
arev (package)	75, 98, 130, 131
\arg (arg)	56
\Aries (܊)	79
\Aries (܊)	79
\aries (܊)	79
\ArrowBoldDownRight (➡)	84
\ArrowBoldRightCircled (○)	84
\ArrowBoldRightShort (◐)	84
\ArrowBoldRightStrobe (■■)	84
\ArrowBoldUpRight (◤)	84
\Arrownot ()/	55
\arrownot ()/	55
arrows	47–50, 54, 68–70, 80, 84, 91, 96, 101, 113
diagonal, for reducing subexpressions	66
dotted	70
double-headed, diagonal	117
extensible	66–70
fletched	54, 84
negated	48, 49, 51
\Arrowvert (  )	61
	63
\arrowvert ( )	61
	63
Arseneau, Donald	115–118
\Asade (߁)	91
\Asamekh (߁)	91
ASCII	9, 11, 81, 110, 124–126, 128, 130
table	125
ascii (package)	81, 125, 130, 131
\ascnode (܊)	79
\Ashin (܊)	91
aspect ratio	78
\ast (*)	26
\ast (*)	24
\ast (*)	26
\Asteriscus (※)	105
\asteriscus (※)	105
\Asterisk (*)	26
\Asterisk (✿)	87
\asterisk (*)	26
\AsteriskBold (✿)	87
\AsteriskCenterOpen (✿)	87
\AsteriskRoundedEnds (✿)	87

asterisks	26, 87, 88
\AsteriskThin ( $\ast$ )	87
\AsteriskThinCenterOpen ( $\text{\textasteriskcenteropen}$ )	87
\asterism ( $\divideontimes$ )	114
astrological symbols	79
astronomical symbols	79, 108
\astrosun ( $\odot$ )	79
\asymp ( $\asymp$ )	34
\asymp ( $\asymp$ )	55
\atan ( $\mathrm{atan}$ )	123
\ataribox ( $\text{\textatbox}$ )	98
\Atav (+)	91
\Ateth ( $\eth$ )	91
\AtForty ( $\text{\textatforty}$ )	100
\AtNinetyFive ( $\text{\textatninetyfive}$ )	100
atomic math objects	56, 123
\AtSixty ( $\text{\textatsixty}$ )	100
\autoleftarrow ( $\longleftarrow$ )	69
\autoleftrightharpoons ( $\Longleftarrow\Rightarrow$ )	69
\autorightarrow ( $\longrightarrow$ )	69
\autorightleftharpoons ( $\Longleftarrow\Longrightarrow$ )	69
\Avav ( $\text{\textavav}$ )	91
average	23
\Ayn ( $\text{\textayn}$ )	15
\Ayod ( $\text{\textayod}$ )	91
\Azayin (=)	91
<b>B</b>	
\B	11
\B ( $\text{\textcircledB}$ )	105
b (esvect package option)	68
\b ( $\text{\textcircledb}$ )	16
\b ( $\text{\textcircledj}$ )	105
\Ba ( $\text{\textcircledH}$ )	95
babel (package)	57, 97
\babygamma ( $\text{\textcircledg}$ )	14
\backapprox ( $\text{\textcircledw}$ )	36
\backapproxeq ( $\text{\textcircledw}$ )	36
\backcong ( $\text{\textcircledg}$ )	36
\backepsilon ( $\text{\textcirclede}$ )	34
\backeqsim ( $\text{\textcircledm}$ )	36
\backneg ( $\text{\textcircledm}$ )	74
\backprime ( $\text{\textcircledl}$ )	73
\backprime ( $\text{\textcircledl}$ )	74
\backsim ( $\text{\textcircledm}$ )	34
\backsim ( $\text{\textcircledm}$ )	37
\backsimeq ( $\text{\textcircledm}$ )	34
\backsimeq ( $\text{\textcircledm}$ )	37
\backslash	61, 73
\backslash	62
\backslashbackslashdiv ( $\text{\textbackslashbackslashdiv}$ )	26
\backslashbacktriplesim ( $\text{\textbackslashbacktriplesim}$ )	37
\Baii ( $\text{\textcircledT}$ )	95
\Baiii ( $\text{\textcircledM}$ )	95
banana brackets	see \llparenthesis and \rrparenthesis
\banceps ( $\text{\textcircledx}$ )	106
\bar ( $\text{\textcircledm}$ )	65
\barb ( $\text{\textcircledb}$ )	14
\barbbrevis ( $\text{\textcircledw}$ )	106
\barbrevis ( $\text{\textcircledo}$ )	106
\barcirk ( $\text{\textcirclede}$ )	115
\bard ( $\text{\textcircledd}$ )	14
\bari ( $\text{\textcircledi}$ )	14
\barin ( $\text{\textcircledE}$ )	59
\barj ( $\text{\textcircledj}$ )	15
\barl ( $\text{\textcircledt}$ )	14
\barlambda ( $\text{\textcircledX}$ )	15
\barleftharpoon ( $\text{\textcircled=}$ )	49
\baro ( $\text{\textcircledf}$ )	25
\baro ( $\phi$ vs. $\Theta$ )	111
\baro ( $\Theta$ )	14
\barp ( $\text{\textcircledp}$ )	14
barred letters	114
\barrightharpoon ( $\text{\textcircled=}$ )	49
\barsci ( $\text{\textcircledf}$ )	14
\barscu ( $\text{\textcircledU}$ )	14
	
\Bart (	106
\baru ( $\text{\textcircledu}$ )	14
\barwedge ( $\text{\textcircledpi}$ )	26
\barwedge ( $\text{\textcircledpi}$ )	24
base-twelve digits	72
\Bat ( $\text{\textcircledm}$ )	101
\Bau ( $\text{\textcircledP}$ )	95
\bauarrow ( $\text{\textcircledz}$ )	84
\baucircle ( $\text{\textcircledC}$ )	90
\baucircle ( $\text{\textcircledO}$ )	90
\baucross ( $\text{\textcircledX}$ )	86
\baudash ( $\text{\textcircledB}$ )	101
\baueclipse ( $\text{\textcircledO}$ )	90
\bauequal ( $\text{\textcircledE}$ )	101
\bauface ( $\text{\textcircledj}$ )	101
\bauforms ( $\text{\textcircledD}$ )	101
\bauforms ( $\text{\textcircledD}$ )	101
\bauhead ( $\text{\textcircledj}$ )	101
\bauhead ( $\text{\textcircledj}$ )	101
\bauhole ( $\text{\textcircledO}$ )	90
\bauplus ( $\text{\textcircledH}$ )	101
\baupunct ( $\text{\textcircledO}$ )	90
\bauquarter ( $\text{\textcircledC}$ )	101
\bauquestion ( $\text{\textcircledF}$ )	101
\lausquare ( $\text{\textcircledB}$ )	90
\lausquare ( $\text{\textcircledB}$ )	90
\bautriangle ( $\text{\textcircledA}$ )	90
\bautriangle ( $\text{\textcircledA}$ )	90
\bauwhitearrow ( $\text{\textcircledE}$ )	84
\bauwindow ( $\text{\textcircledD}$ )	101
\BB ( $\text{\textcircledw}$ )	105
\bba ( $\text{\textcircledw}$ )	105
\bbalpha ( $\text{\textcircledw}$ )	76
\bbar ( $\text{\textcircledb}$ )	114
\bbb ( $\text{\textcircledw}$ )	105
\bbbeta ( $\text{\textcircledw}$ )	76
\Bbbk ( $\text{\textcircledk}$ )	59
\bding (package)	84–87, 89, 90, 111, 130, 131
\bdlar (\$)	76
\bbetter ( $\text{\textcircledF}$ )	104
\bbeuro ( $\text{\textcircledE}$ )	76
\bbfinalnum ( $\text{\textcircledJ}$ )	76
\bbgamma ( $\text{\textcircledg}$ )	76
\bgreekl (mathbbol package option)	76
\BBm ( $\text{\textcircledL}$ )	105
\Bbm ( $\text{\textcircledL}$ )	105
\Bbm ( $\text{\textcircledL}$ )	105
\bbm (package)	76, 130
\bbm ( $\text{\textcircledw}$ )	105
\bbmb ( $\text{\textcircledw}$ )	105
\bbmx ( $\text{\textcircledw}$ )	105
\bbnabla ( $\text{\textcirclednabla}$ )	76
\bbold (package)	76, 130
\bbpe ( $\text{\textcircledP}$ )	76
\bbqof ( $\text{\textcircledP}$ )	76
\bbrevis ( $\text{\textcircledw}$ )	106
\bbslash ( $\text{\textcircledw}$ )	25
\bbyod ( $\text{\textcircledw}$ )	76
\bcontraction	119
\Bda ( $\text{\textcircledf}$ )	95
\Bde ( $\text{\textcircledX}$ )	95
\bdecisive (-+)	104
\Bdi ( $\text{\textcircledT}$ )	95
\Bdo ( $\text{\textcircledf}$ )	95
\Bdu ( $\text{\textcircledM}$ )	95
\Bdwe ( $\text{\textcircledF}$ )	95
\Bdwo ( $\text{\textcircledDelta}$ )	95
\Be ( $\text{\textcircledA}$ )	95
\Beam ( $\text{\textcircledw}$ )	82
\Bearing ( $\text{\textcircledDelta}$ )	82
\because (:)	34, 71
\because (:)	71
\BEL (•)	81
\bell (•)	98
Berry, Karl	133
\beta ( $\beta$ )	57
\betaaup ( $\beta$ )	57
\beth ( $\beth$ )	58

\beth (beth)	58
\betteris (betteris)	104
\between (between)	36
\between (between)	34
\between (between)	37
\Bi (Bi)	95
\bibridge (bibridge)	18
biconditional	<i>see \leftrightarrows and \equiv</i>
\Bicycle (Bicycle)	100
\Big (Big)	110, 112
\big (big)	110, 112
big O (O)	<i>see alphabets, math</i>
\bigast (*)	26
\bigbosonloop (bigbosonloop)	83
\bigbosonloopA (bigbosonloopA)	83
\bigbosonloopV (bigbosonloopV)	83
\bigbox (bigbox)	29
\bigboxasterisk (bigboxasterisk)	30
\bigboxbackslash (bigboxbackslash)	30
\bigboxbot (bigboxbot)	30
\bigboxcirc (bigboxcirc)	30
\bigboxcoasterisk (bigboxcoasterisk)	30
\bigboxdiv (bigboxdiv)	30
\bigboxdot (bigboxdot)	30
\bigboxleft (bigboxleft)	30
\bigboxminus (bigboxminus)	30
\bigboxplus (bigboxplus)	30
\bigboxright (bigboxright)	30
\bigboxslash (bigboxslash)	30
\bigboxtimes (bigboxtimes)	30
\bigboxtop (bigboxtop)	30
\bigboxtriangleup (bigboxtriangleup)	30
\bigboxvoid (bigboxvoid)	30
\bigcap (bigcap)	29
\bigcap (bigcap)	32
\bigcapdot (bigcapdot)	32
\bigcapplus (bigcapplus)	32
\bigcirc (bigcirc)	24
\bigcirc (bigcirc)	88
\BigCircle (BigCircle)	89
\bigcircle (bigcircle)	32
\bigcoast (*)	26
\bigcomplementop (bigcomplementop)	30
\BigCross (BigCross)	89
\bigcup (bigcup)	29
\bigcup (bigcup)	32
\bigcupdot (bigcupdot)	32
\bigcupplus (bigcupplus)	33
\bigcupplus (bigcupplus)	32
\bigcurlyvee (bigcurlyvee)	30
\bigcurlyvee (bigcurlyvee)	29
\bigcurlyvee (bigcurlyvee)	32
\bigcurlyveedot (bigcurlyveedot)	32
\bigcurlywedge (bigcurlywedge)	30
\bigcurlywedge (bigcurlywedge)	29
\bigcurlywedge (bigcurlywedge)	32
\BigDiamondshape (BigDiamondshape)	89
\bigdoublecurlyvee (bigdoublecurlyvee)	33
\bigdoublecurlywedge (bigdoublecurlywedge)	33
\bigdoublevee (bigdoublevee)	33
\bigdoublewedge (bigdoublewedge)	33
\Bigg (Bigg)	110, 112
\bigg (bigg)	110, 112
\BigHBar (BigHBar)	89
\biginterleave (biginterleave)	29
\BigLowerDiamond (BigLowerDiamond)	89
\bignplus (bignplus)	29
\bigoast (bigoast)	33
\bigoasterisk (bigoasterisk)	30
\bigobackslash (bigobackslash)	30
\bigobackslash (bigobackslash)	33
\bigobot (bigobot)	30
\bigocirc (bigocirc)	30
\bigocirc (bigocirc)	33
\bigocoasterisk (bigocoasterisk)	30
\bigodiv (bigodiv)	30
\bigodot (bigodot)	29
\bigodot (bigodot)	33
\bigoleft (bigoleft)	30
\bigominus (bigominus)	30
\bigominus (bigominus)	32
\bigoplus (bigoplus)	29
\bigoplus (bigoplus)	32
\bigoright (bigoright)	30
\bigoslash (bigoslash)	30
\bigoslash (bigoslash)	32
\bigostar (bigostar)	32
\bigotimes (bigotimes)	29
\bigotimes (bigotimes)	32
\bigotop (bigotop)	30
\bigotriangle (bigotriangle)	32
\bigotriangleup (bigotriangleup)	30
\bigovert (bigovert)	32
\bigovoid (bigovoid)	30
\bigparallel (bigparallel)	29
\bigparr (bigparr)	33
\bigplus (+)	30
\bigplus (+)	32
\BigRightDiamond (BigRightDiamond)	89
\bigsqcap (bigsqcap)	30
\bigsqcap (bigsqcap)	29
\bigsqcap (bigsqcap)	32
\bigsqcapdot (bigsqcapdot)	32
\bigsqcupplus (bigsqcupplus)	31
\bigsqcupplus (bigsqcupplus)	32
\bigsqcup (bigsqcup)	29
\bigsqcup (bigsqcup)	33
\bigsqcupdot (bigsqcupdot)	33
\bigsqcupplus (bigsqcupplus)	31
\bigsqcupplus (bigsqcupplus)	33
\BigSquare (BigSquare)	89
\bigsqcupplus (bigsqcupplus)	30
\bigstar (bigstar)	26
\bigstar (bigstar)	73
\bigstar (bigstar)	88
\bigtimes (bigtimes)	30
\bigtimes (bigtimes)	33
\BigTriangleDown (BigTriangleDown)	89
\bigtriangledown (bigtriangledown)	29
\bigtriangledown (bigtriangledown)	111
\bigtriangledown (bigtriangledown)	24
\bigtriangledown (bigtriangledown)	47
\BigTriangleLeft (BigTriangleLeft)	89
\BigTriangleRight (BigTriangleRight)	89
\BigTriangleUp (BigTriangleUp)	89
\bigtriangleup (bigtriangleup)	29
\bigtriangleup (bigtriangleup)	111
\bigtriangleup (bigtriangleup)	24
\bigtriangleup (bigtriangleup)	47
\biguplus (biguplus)	29
\biguplus (biguplus)	33
\bigvarstar (bigvarstar)	26
\BigVBar (BigVBar)	89
\bigvee (bigvee)	29
\bigvee (bigvee)	33
\bigveedot (bigveedot)	33
\bigwedge (bigwedge)	29
\bigwedge (bigwedge)	33
\bigwedgedot (bigwedgedot)	33
\bigwith (&)	33
\binampersand (&)	25
binary operators	24–28
binary relations	34–36, 39–45, 54, 55
negated	34–36, 38
\bindnasrepma (bindnasrepma)	25
\Biohazard (Biohazard)	82
biological symbols	82
birds	92
bishop	104
\bishoppair (bishoppair)	104
\Bja (Bja)	95
\Bje (Bje)	95
\Bjo (Bjo)	95
\Bju (Bju)	95
\Bka (Bka)	95
\Bke (Bke)	95
\Bki (Bki)	95
\Bko (Bko)	95
\Bku (Bku)	95
\BlackBishopOnBlack (BlackBishopOnBlack)	104
\BlackBishopOnWhite (BlackBishopOnWhite)	104
blackboard bold	<i>see alphabets, math</i>



\blackdiamond (◆) . . . . .	26	\Bmo (՞) . . . . .	95	\Bouquet (՞) . . . . .	101
\BlackEmptySquare (՞) . .	104	\bmod . . . . .	56	\Bowtie (❖) . . . . .	98
\BlackKingOnBlack (՞) . .	104	\Bmu (՞՞) . . . . .	95	\bowtie (❖) . . . . .	34
\BlackKingOnWhite (՞) . .	104	\Bna (՞) . . . . .	95	\bowtie (❖) . . . . .	26, 27
\BlackKnightOnBlack (՞) . .	104	\BNc (՞) . . . . .	95	\Box (□) . . . . .	73
\BlackKnightOnWhite (՞) . .	104	\BNcc (՞) . . . . .	95	\Box (□) . . . . .	73
\blacklozenge (♦) . . . . .	73	\BNccc (՞) . . . . .	95	\Box (□) . . . . .	28
\blacklozenge (♦) . . . . .	88	\BNcd (՞) . . . . .	95	box-drawing symbols . . . . .	107
\BlackPawnOnBlack (՞) . .	104	\BNcm (՞՞՞) . . . . .	95	\boxast (❖) . . . . .	25
\BlackPawnOnWhite (՞) . .	104	\BNd (՞՞) . . . . .	95	\boxasterisk (❖) . . . . .	28
\BlackQueenOnBlack (՞) . .	104	\BNdc (՞՞՞) . . . . .	95	\boxbackslash (❖) . . . . .	28
\BlackQueenOnWhite (՞) . .	104	\BNdcc (՞՞՞) . . . . .	95	\boxbackslash (❖) . . . . .	28
\BlackRookOnBlack (՞) . .	104	\BNdccc (՞՞՞՞) . . . . .	95	\boxbar (❖) . . . . .	25
\BlackRookOnWhite (՞) . .	104	\Bne (՞՞) . . . . .	95	\boxbot (❖) . . . . .	28
\blacksmiley (☺) . . . . .	98	\BNi (՞) . . . . .	95	\boxbox (❖) . . . . .	25
\blacksquare (■) . . . . .	73	\Bni (՞) . . . . .	95	\boxbox (❖) . . . . .	28
\blacksquare (■) . . . . .	28	\BNii (՞՞) . . . . .	95	\boxbslash (❖) . . . . .	25
\blackstone . . . . .	105	\BNiii (՞՞՞) . . . . .	95	\boxcirc (❖) . . . . .	28
\blacktriangle (▲) . . . . .	73	\BNiv (՞՞՞) . . . . .	95	\boxcircle (❖) . . . . .	25
\blacktriangle (▲) . . . . .	47	\BNix (՞՞՞՞) . . . . .	95	\boxcoasterisk (❖) . . . . .	28
\blacktriangledown (▼) . . .	28	\BNl (՞՞՞՞) . . . . .	95	\boxdiv (❖) . . . . .	28
\blacktriangledown (▼) . . .	73	\BNlx (՞՞՞) . . . . .	95	\boxdot (❖) . . . . .	28
\blacktriangledown (▼) . . .	47	\BNlx (՞՞՞) . . . . .	95	\boxdot (❖) . . . . .	24, 25
\blacktriangleleft (◀) . . . .	28	\BNlxxx (՞՞՞) . . . . .	95	\boxdot (❖) . . . . .	28
\blacktriangleleft (◀) . . . .	46	\BNm (՞՞) . . . . .	95	\boxdotleft (↔) . . . . .	49
\blacktriangleleft (◀) . . . .	47	\Bno (՞՞՞) . . . . .	95	\boxdotleft (↔) . . . . .	49
\blacktriangleleft (◀) . . . .	28	\Bnu (՞) . . . . .	95	\boxdotright (↔) . . . . .	49
\blacktriangleright (▶) . . . .	28	\BNv (՞՞) . . . . .	95	\boxempty (□) . . . . .	25
\blacktriangleright (▶) . . . .	46	\BNvi (՞՞՞) . . . . .	95	\boxLeft (↔) . . . . .	49
\blacktriangleright (▶) . . . .	47	\BNvii (՞՞՞՞) . . . . .	95	\boxleft (❖) . . . . .	28
\blacktriangleup (▲) . . . . .	28	\BNviii (՞՞՞՞՞) . . . . .	95	\boxleft (↔) . . . . .	49
blank . . . . . see \textblank		\Bnwa (՞) . . . . .	95	\boxminus (❖) . . . . .	28
\Bleech (△) . . . . .	100	\BNx (՞) . . . . .	95	\boxminus (❖) . . . . .	24
\blitza (⚡) . . . . .	23, 55	\BNxc (՞՞՞) . . . . .	95	\boxminus (❖) . . . . .	28
\blitzb (⚡) . . . . .	55	\BNxl (՞՞) . . . . .	95	\boxplus (❖) . . . . .	28
\blitzc (⚡) . . . . .	55	\BNxx (՞) . . . . .	95	\boxplus (❖) . . . . .	24
\blitzd (⚡) . . . . .	55	\BNxxx (՞) . . . . .	95	\boxplus (❖) . . . . .	28
\blitze (⚡) . . . . .	55	\Bo (՞) . . . . .	95	\boxright (❖) . . . . .	28
block-element symbols . . . .	107	body-text symbols . . . . .	10–22	\boxright (↔) . . . . .	49
\Bm (՞) . . . . .	105	bold symbols . . . . .	123–124	\boxslash (❖) . . . . .	28
bm (package) . . . . .	124, 130, 132	\boldmath . . . . .	124	\boxslash (❖) . . . . .	28
\bm . . . . .	124	\boldsymbol . . . . .	124	\boxtimes (❖) . . . . .	28
\bm (՞) . . . . .	105	\boldsymbol . . . . .	101	\boxtimes (❖) . . . . .	24
\Bma (՞) . . . . .	95	Boolean domain (B) . . . . .	see alphabets, math	\boxtimes (❖) . . . . .	28
\Bme (՞) . . . . .	95	Boolean logic gates . . . . .	81	\boxtop (❖) . . . . .	28
\Bmi (՞) . . . . .	95	born . . . . . see \textborn		\boxtriangleup (❖) . . . . .	28
		bosons . . . . .	83	\boxvert (❖) . . . . .	28
		\bot (⊥) . . . . .	23, 59, 116	\boxvoid (□) . . . . .	28
		\bot (⊥) . . . . .	59	\boy (♂) . . . . .	79
		\botdoteq (=) . . . . .	36	\Bpa (†) . . . . .	95
				\Bpaiii (〽) . . . . .	95
				\BPamphora (՞) . . . . .	96
				\BParrow (») . . . . .	96
				\BPbarley (՞) . . . . .	96

\BPbilly (‡)	96
\BPboar (¶)	96
\BPbronze (¤)	96
\BPbull (₹)	96
\BPcauldroni (ℳ)	96
\BPcauldronii (ℳ)	96
\BPchariot (₪)	96
\BPchassis (₡)	96
\BPCloth (ℳ)	96
\BPcow (₭)	96
\BPcup (₵)	96
\Bpe (₱)	95
\Bewe (₩)	96
\BPfoal (₭)	96
\BPgoat (₩)	96
\BPgoblet (ℳ)	96
\BPgold (₭)	96
\BPhorse (₭)	96
\Bpi (₭)	95
\BPman (₭)	96
\BPNanny (₩)	96
\Bpo (₵)	95
\BPolive (₽)	96
\BPOX (ℳ)	96
\Bpig (₵)	96
\BPram (₪)	96
\BPsheep (₩)	96
\BPsow (₵)	96
\BPspear (₪)	96
\BPsword (₭)	96
\BPTalent (ℳ)	95
\Bpte (₵)	95
\Bpu (ℳ)	95
\Bpuui (ℳ)	95
\Bpvola (₵)	95
\Bpvolb (₱)	95
\BPvolcd (₩)	95
\BPvolcf (₩)	95
\BPwheat (₱)	96
\BPwheel (₪)	96
\BPwine (ℳ)	96
\BPwineiinh (ℳ)	96
\BPwineiiih (ℳ)	96
\BPwineivh (ℳ)	96
\BPwoman (฿)	96
\BPwool (ℳ)	96
\BPwta (₺)	95
\BPwtb (฿)	95
\BPwtc (ℳ)	95
\BPwtd (ℳ)	95
\Bqa (ଓ)	95
\Bqe (ଓ)	95
\Bqi (ଡ)	95
\Bqo (ଡ)	95
\Bra (ର୍)	95
bra	61
\braceld (ର୍)	119
\bracerd (ର୍)	119
\bracevert ( )	61
\bracevert ( )	63
brackets	see delimiters
\Braii (ଡି)	95
\Braiii (ଡିଇ)	95
braket (package)	61
\Bre (ସି)	95
\Break (Break)	80
\breve (ୟ)	65
\breve (ୟ)	18
breve (ୟ)	see accents
\brevis (ୟ)	106
\Bri (ରି)	95
\Bro (ରୋ)	95
\Broii (ଡ଼ିଇ)	95
\brokenvert (ରୁ)	98
Bronger, Torsten	116
\Bru (ସୁରୁଳିତ)	95
\BS (ସାରି)	81
\Bsa (ସାରି)	95
\Bse (ସାରି)	95
\BSEfree (ସାରି)	82
\Bsi (ସାରି)	95
\Bso (ସାରି)	95
\BSpace (Space)	80
\Bsu (ସାରି)	95
\Bswa (ସାରି)	95
\Bswi ([x])	95
\Bta (ତାରି)	95
\Btaii (ତାଇଇ)	95
\Bte (ତେଇ)	95
\Bti (ତିଏଇ)	95
\Bto (ତୋଇ)	95
\Btu (ତୁଏଇ)	95
\Btwe (ତେବେ)	96
\Btwo (ତୁଇଇ)	95
\Bu (ବୁଇ)	95
\BUFd (ଫିଲ୍ଡ)	81
buffers	81
\BUFl (ଫିଲ୍ଡ)	81

\BUFr (ଫିଲ୍ଡ)	81
\BUFu (ଫିଲ୍ଡ)	81
\BUi (ଫି)	96
\BUii (ଫିଇ)	96
\BUiii (ଫିଇଇ)	96
\BUiv (ଫିଇଇଇ)	96
\BUix (ଫିଇଇଇଇ)	96
\bullet (•)	24
\bullet (•)	26
bullseye	see \textbullseye
\BumpedEq (≈)	36
\bumpedEq (≈)	36
\Bumpeq (≈)	34
\Bumpeq (≈)	37
\bumpeq (≈)	34
\bumpeq (≈)	37
\upperhand (ଫି)	104



\Burns (ବର୍ନ୍ସ)	106
\BusWidth (ବୁସ୍‌ବିଥ୍ଦ)	81
\BUv (ବୁପ୍ପି)	96
\BUvi (ବୁପ୍ପି)	96
\BUvii (ବୁପ୍ପିଇଇ)	96
\BUviii (ବୁପ୍ପିଇଇଇ)	96
\BUx (ବୁପ୍ପିଇଇଇଇ)	96
\BUxi (ବୁପ୍ପିଇଇଇଇଇ)	96
\BUxii (ବୁପ୍ପିଇଇଇଇଇଇ)	96
\Bwa (ବୁପ୍ପିଇଇଇଇଇଇ)	95
\Bwe (ବୁପ୍ପିଇଇଇଇଇଇଇ)	95
\Bwi (ବୁପ୍ପିଇଇଇଇଇଇଇ)	95
\Bwo (ବୁପ୍ପିଇଇଇଇଇଇଇ)	95
\Bza (ବୁପ୍ପିଇଇଇଇଇଇଇ)	95
\Bze (ବୁପ୍ପିଇଇଇଇଇଇଇ)	95
\Bzo (ବୁପ୍ପିଇଇଇଇଇଇଇ)	95

## C

\C ()	105
c (esvect package option)	68
\c (କ୍ରିଏଟିଭ୍)	16, 127
\c (କ୍ରିଏଟିଭ୍)	105
\Ca (କାର୍ଯ୍ୟ)	96
calligra (package)	76, 130, 132
Calligra (font)	76
calrsfs (package)	76
\CAN (↑)	81
cancel (package)	66
\Cancer (କାନ୍ସର)	79
\cancer (କାନ୍ସର)	79
\Cap (କାପି)	24
\Cap (କାପି)	27
\cap (କାପି)	26
\cap (କାପି)	24

\cap (∩) . . . . .	26	\check (ˇ) . . . . .	65	\circledminus . . . . .	see \ominus
\capdot (翫) . . . . .	26	check marks . . . . .	11, 74, 86, 90, 98,	\circledotleft . . . . .	see \circleddotleft
\capplus (翏) . . . . .	26	100, 111		\circledotright . . . . .	see \circleddotright
\Capricorn (♑) . . . . .	79	\checked (✓) . . . . .	98	\circledplus . . . . .	see \oplus
\capricornus (♑) . . . . .	79	\CheckedBox (☒) . . . . .	86	\circledR (®, ®) . . . . .	11, 59
\capturesymbol (×) . . . . .	104	\Checkmark (✓) . . . . .	86	\circledS (Ⓢ, Ⓢ) . . . . .	59
card suits . . . . .	73–75, 90	\checkmark (✓) . . . . .	11	\circledslash . . . . .	see \oslash
cardinality . . . . .	see \aleph	\checkmark (✓) . . . . .	74	\circledtimes . . . . .	see \otimes
care of (%) . . . . .	74	\checkmark (✓ vs. ✓) . . . . .	111	\circledvee (ⓧ) . . . . .	25
caret . . . . .	see \^	\checkmark (✓) . . . . .	90	\circledwedge (ⓧ) . . . . .	25
Carlisle, David . . . . .	1, 129, 130	\CheckmarkBold (✓) . . . . .	86	\circleleft (←○) . . . . .	49
caron (ˇ) . . . . .	see accents	\checksymbol (+) . . . . .	104	\circleright (○→) . . . . .	49
carriage return . . . . .	80, 81, 90, 113	\chemarr (package) . . . . .	69, 130, 131	circles . . . . .	89–90, 98, 105
\carriagereturn (⤠) . . . . .	90	\chemarrow (package) . . . . .	54, 69, 130	\CircleShadow (○) . . . . .	89
Cartesian product . . . . .	see \times	\chemarrow (→) . . . . .	54	\CircleSolid (●) . . . . .	89
castle . . . . .	104	Chen, Raymond . . . . .	133	\Circpipe (○) . . . . .	82
\castlingchar (O) . . . . .	104	chess symbols . . . . .	104	\circcplus (†) . . . . .	26
\castlinghyphen (-) . . . . .	104	\chesscomment (RR) . . . . .	104	\Circsteel (●) . . . . .	82
\catal (翏) . . . . .	106	\chessetc (  ) . . . . .	104	circumflex (˜) . . . . .	see accents
\Catalexis (翏) . . . . .	105	\chesssee (—) . . . . .	104	\circumflexus (˜) . . . . .	18
\catalexis (翏) . . . . .	105	\chi (χ) . . . . .	57	\Cja (◊) . . . . .	96
catamorphism . . . . .	see \lparenthesis and \rparenthesis	china2e (package) . . . . .	21, 56, 76, 77, 108, 109, 130, 132	\Cjo (Ѡ) . . . . .	96
\cb (܂) . . . . .	19	\chiup (χ) . . . . .	57	\Cka (܀) . . . . .	96
\Cc (܂) . . . . .	105	\ci (܂) . . . . .	96	\Cke (܁) . . . . .	96
\cc (܂܂) . . . . .	21	cipher symbols . . . . .	108	\Cki (܀܀) . . . . .	96
\cc (܂܂) . . . . .	105	\circ (○) . . . . .	24, 74, 115	\Cko (܀܀) . . . . .	96
\ccby (܂܂܂) . . . . .	21	\circ (○) . . . . .	26	\Cku (܀܀) . . . . .	96
\Ccc (܂܂܂) . . . . .	105	\circeq (⊐) . . . . .	36	\Cla (܀܀) . . . . .	96
cclicenses (package) . . . . .	21, 130, 131	\circeq (⊐) . . . . .	34	\Cle (܀܀) . . . . .	96
\ccnc (܂܂) . . . . .	21	\circeq (⊐) . . . . .	37	\CleaningA (܀) . . . . .	100
\ccnd (܂܂) . . . . .	21	\CIRCLE (●) . . . . .	98	\CleaningF (܀) . . . . .	100
\ccsa (܂܂) . . . . .	21	\Circle (○) . . . . .	89	\CleaningFF (܀) . . . . .	100
\cdot (·) . . . . .	24, 114	\Circle (○ vs. ○) . . . . .	111	\CleaningP (܀) . . . . .	100
\cdot (·) . . . . .	26, 71	\Circle (○) . . . . .	98	\CleaningPP (܀) . . . . .	100
\cdotop (·) . . . . .	70	\circlearrowleft (↺) . . . . .	49	\Cli (≤) . . . . .	96
\cdotop (·) . . . . .	71	\circlearrowleft (↺) . . . . .	48	\clickb (○) . . . . .	14
\cdots . . . . .	70	\circlearrowleft (↺) . . . . .	51	\clickc (○) . . . . .	14
\Coe (܀܀) . . . . .	96	\circlearrowright (↻) . . . . .	49	\clickt (݄) . . . . .	14
Cedi . . . . .	see \textcolonmonetary	\circlearrowright (↻) . . . . .	48	\Clo (+) . . . . .	96
cedilla (˜) . . . . .	see accents	\circlearrowright (↻) . . . . .	51	clock (package) . . . . .	102, 130, 131
celestial bodies . . . . .	79, 108	\circlearrowright (↻) . . . . .	51	\clock (⌚) . . . . .	102
\celsius (°C) . . . . .	78	\circled numbers . . . . .	87, 105	\clock (⌚) . . . . .	98
\Celtcross (܂) . . . . .	101	\circledA (Ⓐ) . . . . .	101	clock symbols . . . . .	98, 100, 102
\cent (¢) . . . . .	20	\circledast (⊗) . . . . .	24	\ClockFramefalse . . . . .	102
\centerdot (■) . . . . .	26	\circledast (⊗) . . . . .	28	\ClockFrametrue . . . . .	102
\centerdot (.) . . . . .	24	\circledbar (◐) . . . . .	25	\Clocklogo (⌚) . . . . .	100
centernot (package) . . . . .	115	\circledbslash (◑) . . . . .	25	\ClockStyle . . . . .	102
\centernot . . . . .	115	\circledcirc (◎) . . . . .	24	\clocktime . . . . .	102
centigrade . . . . .	see \textcelsius	\circledcirc (◎) . . . . .	28	\closedcurlyvee (݄) . . . . .	26
\centre (田) . . . . .	104	\circleddash (⊖) . . . . .	24	\closedcurlywedge (݄) . . . . .	26
cents . . . . .	see \textcent	\circleddash (⊖) . . . . .	28	\closedequal (≡) . . . . .	37
\CEsign (€) . . . . .	82	\circleddot . . . . .	see \odot	\closedniomega (߃) . . . . .	14
\Cga (܀܀) . . . . .	96	\circleddotleft (←○) . . . . .	49	\closedprec (݄) . . . . .	37
chancery (package) . . . . .	130	\circleddotright (○→) . . . . .	49		
\changenotsign . . . . .	36	\circledgtr (◎) . . . . .	35		
\char . . . . .	9, 113, 122, 125, 129	\circledless (⊖) . . . . .	35		
Charter (font) . . . . .	20, 33				

\closedrevepsilon (⌚) . . . . .	14	\Colonsim (˸~) . . . . .	39	\cot (cot) . . . . .	56
\closedsucc (▷) . . . . .	37	\colonsim (˸~) . . . . .	41	\coth (coth) . . . . .	56
\Cloud (֍) . . . . .	101	\colonsim (˸~) . . . . .	39	\counterplay (↭) . . . . .	104
clovers . . . . .	87, 88	\colonsim (˸~) . . . . .	35	Courier (font) . . . . .	20
\Clu (֍)	96	combelow (package) . . . . .	19, 130, 132	CP1252 . . . . .	see code page 1252
clubs (suit) . . . . .	73–75, 90	combinatorial logic gates . . . . .	81	CP437 . . . . .	see code page 437
\clubsuit (♣) . . . . .	73	comma-below accent (֍) . . . . .	see accents	\Cpa (†) . . . . .	96
\clubsuit (♦) . . . . .	74	communication symbols . . . . .	82	\Cpe (§) . . . . .	96
\Cma (֍)	96	commutative diagrams . . . . .	117	\Cpi (֎) . . . . .	96
\Cme (֎)	96	comp.text.tex (newsgroup) . . . . .	9, 23, 24, 113–118	\Cpo (֎) . . . . .	96
\Cmi (֎)	96	\compensation (❀) . . . . .	104	\Cpu (֎) . . . . .	96
cml (package) . . . . .	23, 27, 33, 40, 130	\complement (ℭ) . . . . .	59	\CR (♪) . . . . .	81
\Cmo (Φ) . . . . .	96	\complement (ℭ) . . . . .	59	\cr . . . . .	115
\Cmu (֎)	96	\complement (C) . . . . .	32	\Cra (֍)	96
\Cna (֎)	96	complete shuffle product (□□) . . . . .	27	\Cre (߰)	96
\Cne (ܵ)	96	\COMPLEX (C) . . . . .	56	Creative Commons licenses . . . . .	21
\Cni (ܶ)	96	\Complex (C) . . . . .	56	crescent (fge package option) . . . . .	65
\Cno (ܷ)	96	complex numbers (C) . . . . .	see alphabets, math	\Cri (ܸ)	96
\Cnu (ܵ)	96	composited accents . . . . .	16	\Cro (ܹ)	96
\Co (֎)	96	Comprehensive TeX Archive Network . . . . .	1, 9, 66, 77, 110, 126, 129, 130	\Cross (×) . . . . .	89
\coAsterisk (*) . . . . .	26	computer hardware symbols . . . . .	80	\Cross († vs. † vs. ×) . . . . .	111
\coasterisk (*) . . . . .	26	computer keys . . . . .	80	\Cross (†) . . . . .	86
code page 1252 . . . . .	126	Computer Modern (font) . . . . .	110, 112, 125	\Cross (†) . . . . .	101
table . . . . .	128	\ComputerMouse (🖱) . . . . .	80	cross ratio . . . . .	see \textrecipie
code page 437 . . . . .	81, 107, 125	\cong (≡) . . . . .	34	\crossb (ܭ) . . . . .	14
\Coffeecup (☕) . . . . .	100	\cong (≈) . . . . .	37	\CrossBoldOutline (†) . . . . .	86
\coh (⌚) . . . . .	40	congruent . . . . .	see \equiv	\CrossClowerTips (❖) . . . . .	86
coins, ancient . . . . .	21	\conjunction (ܶ) . . . . .	79	\crossd (ܭ) . . . . .	14
\colon . . . . .	70	conjunction, logical . . . . .	see \wedge and \&	\Crossedbox (☒) . . . . .	100
\colon (:) . . . . .	70	consequence relations . . . . .	39	crosses . . . . .	86, 101, 105
\colon (:) . . . . .	71	contradiction symbols . . . . .	23, 55	\crossh (ܭ) . . . . .	14
\Colonapprox (˸~) . . . . .	35	control characters . . . . .	81	\CrossMaltese (߰) . . . . .	86
\Colonapprox (˸~) . . . . .	39	converse implication . . . . .	see \leftarrow and \subset	\crossnilambda (ܳ) . . . . .	14
\Colonapprox (˸~) . . . . .	41	converse nonimplication . . . . .	see \leftarrow and \subset	\CrossOpenShadow (†) . . . . .	86
\Colonapprox (˸~) . . . . .	39	\convolution (*) . . . . .	26	\CrossOutline (†) . . . . .	86
\Colonapprox (˸~) . . . . .	35	\Coppa (߰) . . . . .	97	crotchet . . . . .	see musical symbols
\coloncolon (::) . . . . .	41	\coppa (߰) . . . . .	97	\crtilde (ܭ) . . . . .	18
\coloncolonapprox (˸~) . . . . .	41	\coprod (□□) . . . . .	23, 29	\Cru (ܲ) . . . . .	96
\coloncolonquals (::=) . . . . .	41	\coprod (□□) . . . . .	32	crucifixes . . . . .	86, 101
\coloncolonminus (˸–) . . . . .	41	copyright . . . . .	10, 21, 127	\Crux (†) . . . . .	65
\coloncolonsim (˸~) . . . . .	41	\copyright (©) . . . . .	10	\crux (†) . . . . .	65
\Coloneq (˸–) . . . . .	35	\corner (߰) . . . . .	20	\Csa (߰) . . . . .	96
\Coloneq (˸–) . . . . .	39	corners, box . . . . .	107	\csc (csc) . . . . .	56
\Coloneq (:=) . . . . .	23, 36	\corona (ܶ) . . . . .	106	\Cse (߰) . . . . .	96
\Coloneq (˸–) . . . . .	39	\coronainv (ܻ) . . . . .	106	\cshuffle (□□) . . . . .	27
\Coloneq (˸–) . . . . .	35	\corresponds (ܶ) . . . . .	74	\Csi (߰) . . . . .	96
\Coloneq (:=) . . . . .	37	\corresponds (ܶ) . . . . .	36	\Cso (߰) . . . . .	96
\Coloneqq (:=) . . . . .	35	\cos (cos) . . . . .	56, 123	\Csu (ܭ) . . . . .	96
\Coloneqq (:=) . . . . .	39	\cosh (cosh) . . . . .	56	\Cta (†) . . . . .	96
\Coloneqq (:=) . . . . .	39			CTAN . . . . .	see Comprehensive TeX Archive Network
\Coloneqq (:=) . . . . .	23, 35			\Cte (ݪ) . . . . .	96
colonequals (package) . . . . .	23, 41, 130, 131			\Cti (߰) . . . . .	96
\colonequals (:=) . . . . .	23, 41				
\colonminus (˸–) . . . . .	41				
\Colonsim (˸~) . . . . .	35				

\Cto (F)	96
\Ctrl (Ctrl)	80
\Ctu (F <sub>1</sub> )	96
\Cu (Y)	96
\Cube (█ █ █ █ █ █)	102, 113
cube root	see \sqrt
\Cup (U)	24
\Cup (U)	27
\cup (U)	26
\cup (U)	24, 114, 123
\cup (U)	26
\cupdot (U)	26
\cupplus (U)	26, 27
\curlyc (c)	14
\curlyeqprec (≤)	36
\curlyeqprec (≥)	34
\curlyeqprec (≈)	37
\curlyeqsucc (≥)	36
\curlyeqsucc (≈)	34
\curlyeqsucc (>)	37
\curlyesh (f)	14
\curlyvee (Y)	26
\curlyvee (Y)	24
\curlyvee (Y)	26
\curlyveedot (Y)	26
\curlyveedownarrow (Y)	25
\curlyveeuparrow (Y)	25
\curlywedge (A)	26
\curlywedge (A)	24
\curlywedge (A)	26
\curlywedgedot (A)	26
\curlywedgedownarrow (A)	25
\curlywedgeuparrow (A)	25
\curlyyogh (Z)	14
\curlyz (Z)	14
\currency (O)	20
currency symbols	20, 21, 76
\curvearrowbotleft (↔)	49
\curvearrowbotleftright (↔)	49
\curvearrowbotright (↔)	49
\curvearrowdownup (↔)	50
\curvearrowleft (↖)	49
\curvearrowleft (↖)	48
\curvearrowleft (↖)	51
\curvearrowleftright (↖)	49
\curvearrowleftright (↖)	50
\curvearrownesw (↖)	50
\curvearrownwse (↖)	50
\curvearrowright (↗)	49
\curvearrowright (↗)	48
\curvearrowright (↗)	51
\curvearrowrightleft (↖)	50
\curvearrowswen (↖)	50
\curvearrowswne (↖)	50
\curvearrowupdown (↕)	50
\Cutleft (≈)	84
\Cutline (---)	84
cutoff subtraction	see \dotdiv
\Cutright (≈)	84
\Cwa (λ)	96
\Cwe (I)	96
\Cwi (K)	96
\Cwo (J)	96
\Cxa ()()	96
\Cxe (H)	96
\Cya (O)	96
\Cyo (W)	96
\cyprfamily	96
Cypriot	96
cypriot (package)	96, 130, 132
\Cza (X)	96
\Czo (S)	96
<b>D</b>	
\D (█)	19
d (esvect package option)	68
\d (█)	16
\dag (†)	10, 128
\dagger (†)	24
\daleth (beth)	58
\daleth (daleth)	58
\danger (triangle)	101
dangerous bend symbols	99
\DArrow (█)	80
\dasharrow see \dashrightarrow	
\dasheddownarrow (↓)	50
\dashedleftarrow (←)	50
\dashednearrow (↗)	50
\dashednarrow (↖)	50
\dashedrightarrow (→)	50
\dashedsearrow (↘)	50
\dashedswarrow (↙)	50
\dasheduparrow (↑)	50
\dashint (f)	116
\dashleftarrow (↔)	48
\dashleftarrow (←)	51
\dashleftrightarrow (↔)	49
\dashrightarrow (→)	48
\dashrightarrow (→)	51
\DashV (≡)	36
\Dashv (≡)	36
\dashv (¬)	34
\dashv (¬)	37
\dashVv (≡)	36
\davidsstar (◊)	87
\DavidStar (◇)	87
\DavidStarSolid (★)	87
\dBar (  )	106
\dbar (d̄)	114
\dbend (B)	99
\dblacnt (package)	118
\dblcolon (::)	39
\DCa (◀)	81
\DCb (↑)	81
\DCc (!!)	81
\DCd (¶)	81
\DD (D)	99
\ddag (‡)	10, 128
\ddagger (‡)	24
\ddashint (f̄)	116
\dddot (■)	65
\ddot (■)	65
\ddotstile (H)	39
\ddigamma (F)	97
\DDohne (D)	99
\ddot (■)	65
\ddotdot (·)	26, 71
\ddots (··)	70, 117
\ddots (··)	71
\ddotstile (H)	39
\ddotstile (H)	39
\ddottstile (H)	39
\DeclareFontFamily	122
\DeclareFontShape	122
\DeclareMathOperator	123
\DeclareMathOperator*	123
\declareslashed	115
\DeclareUnicodeCharacter	128
\decofourleft (¤)	88
\decofourright (¤)	88
\decoone (☒)	88
\decosix (❖)	88
\decothreyleft (¤)	88
\decothreeright (¤)	88
\decotwo (❖)	88
definite-description operator (?)	113
definition symbols	23, 118
\deg (deg)	56
\degree (°)	73
\degree (°)	78
degrees	see \textdegree
\DEL (Δ)	81
\Del (Del)	80
\Deleatur	see \Denarius
delimiters	60–65
text-mode	65
variable-sized	61–64
wavy-line	62, 63
\Delta (Δ)	57
\delta (δ)	57
\deltaup (δ)	57
demisemiquaver	see musical symbols
\Denarius (§)	20
\denarius (☒)	21
\dental (▀)	18
derivative, partial	see \partial
\descnode (⌚)	79
\det (det)	56

\devadvantage (⌚) ..... 104  
\dfourier (⌚) ..... 40  
\dfourier (⌚) ..... 40  
\DFT (⌚) ..... 70  
\dft (⌚) ..... 70  
\DH (Ɖ) ..... 14  
\DH (Ɖ) ..... 11, 127  
\dh (ð) ..... 14  
\dh (ð) ..... 11, 127  
diacritics ..... *see* accents  
\diaeresis ( ⓘ) ..... 18  
diæresis ( ⓘ) ..... *see* accents  
\diagdown (＼) ..... 73  
\diagdown (＼) ..... 73  
\diagdown (＼) ..... 37  
\diagonal (↗) ..... 104  
\diagup (↗) ..... 73  
\diagup (↗) ..... 73  
\diagup (↗) ..... 37  
\diameter (∅) ..... 73  
\diameter (∅) ..... 23  
\diameter (∅) ..... 74  
\diameter (∅) ..... 98  
\Diamond (◊) ..... 73  
\Diamond (◊) ..... 73  
\Diamond (◊) ..... 28  
\diamond (◊) ..... 24  
\diamond (◊) ..... 28  
\diamondbackslash (◊) ..... 28  
\Diamondblack (◆) ..... 73  
\diamonddiamond (◊) ..... 28  
\Diamondddot (◊) ..... 73  
\diamonddot (◊) ..... 28  
\DiamondddotLeft (↔◊) ..... 49  
\Diamondddotleft (↔◊) ..... 49  
\DiamondddotRight (↔◊) ..... 49  
\Diamondddotright (↔◊) ..... 49  
\diamondddots (,:) ..... 26, 71  
\DiamondLeft (↔◊) ..... 49  
\Diamondleft (↔◊) ..... 49  
\diamondminus (◊) ..... 28  
\diamondplus (◊) ..... 28  
\DiamondRight (↔◊) ..... 49  
\Diamondright (↔◊) ..... 49  
diamonds ..... 89–90  
diamonds (suit) ..... 73–75, 90  
\DiamondShadowA (◊) ..... 89  
\DiamondShadowB (◊) ..... 89  
\DiamondShadowC (◊) ..... 89  
\Diamondshape (◊) ..... 89  
\diamondslash (◊) ..... 28  
\DiamondSolid (◆) ..... 89  
\diamondsuit (◊) ..... 73  
\diamondsuit (◊) ..... 74  
\diamondtimes (◊) ..... 28  
\diamondvert (◊) ..... 28  
\diatop ..... 20, 118

\diaunder ..... 20, 118  
dice ..... 102, 103, 113  
dictionary symbols ..... 12–15, 106  
dictsym (package) ..... 106, 130, 131  
died ..... *see* \textdied  
differential, inexact ..... *see* \dbar  
\Digamma (F) ..... 97  
\digamma (F) ..... 57, 97  
\digamma (F) ..... 97  
digital logic gates ..... 81  
digits ..... 72  
    LCD ..... 78  
    Mayan ..... 72  
    old-style ..... 22  
    segmented ..... 78  
\dim (dim) ..... 56  
\ding ..... 12, 84–88, 90  
dingautolist ..... 87  
dingbat (package) ..... 85, 90, 111, 130,  
                       131  
dingbat symbols ..... 84–90  
\Diple (>) ..... 105  
\diple (>) ..... 105  
\Diple\* (>) ..... 105  
\diple\* (>) ..... 105  
Dirac notation ..... 61  
discount ..... *see* \textdiscount  
discretionary hyphen ..... 126  
disjoint union ..... 23  
disjunction ..... *see* \vee  
\displaystyle ..... 116, 118, 123  
ditto marks ..... *see* \textquotedbll  
\div (÷) ..... 24  
\div (÷) ..... 27  
\divdot (÷) ..... 26  
\divideontimes (\*) ..... 26  
\divideontimes (\*) ..... 24  
\divides (|) ..... 36  
\divides (/) ..... 37  
division ..... 24, 66  
    non-commutative ..... 70  
division times ..... *see* \divideontimes  
divorced ..... *see* \textdivorced  
\DJ (DJ) ..... 11  
\dj (đ) ..... 11  
\dlbari (‡) ..... 14  
\DJL (►) ..... 81  
\dlsh (↔) ..... 49  
\ndtstile (|||) ..... 39  
\ndtstile (|||) ..... 39  
\ndtstile (|||) ..... 39  
\ndtstile (|||) ..... 39  
do not enter ..... *see* \noway  
does not divide ..... *see* \nmid  
does not exist ..... *see* \nexists  
does not imply ..... 115  
\Dohne (Ԁ) ..... 99

dollar ..... *see* \textdollar  
dollar sign ..... *see* \\$  
\Donwash (☒) ..... 100  
\dot ( ⓘ) ..... 65  
dot accent ( ⓘ or ⓘ) ..... *see* accents  
dot symbols ..... 10, 70–72, 117  
DotArrow (package) ..... 70, 130, 132  
\dotarrow (→) ..... 70  
\dotcup (∪) ..... 23, 114  
\dotdiv (÷) ..... 26  
\Doteq ..... *see* \doteqdot  
\Doteq (÷) ..... 37  
\doteq (÷) ..... 34  
\doteq (÷) ..... 37  
\doteqdot (÷) ..... 34  
\doteqdot (÷) ..... 37  
dotless *j* (j)  
    text mode ..... 16  
dotless *i* (i)  
    math mode ..... 65, 73  
    text mode ..... 16  
dotless *j* (j)  
    math mode ..... 65, 73  
\dotmedvert (+) ..... 27  
\dotminus (÷) ..... 27  
\dotplus (+) ..... 26  
\dotplus (+) ..... 24  
\dots (...) ..... 10, 128  
dots (ellipses) ..... 10, 70–73, 117  
\dotsts (...) ..... 71  
\dotsc (...) ..... 71  
\dotseq (÷) ..... 36  
\dotssi (...) ..... 71  
\dotssint (ſ) ..... 32  
\dotsm (...) ..... 71  
\dotso (...) ..... 71  
dotted arrows ..... 70  
dotted union (∪) ..... 123  
\dottedtilde (˜) ..... 18  
\dottimes (×) ..... 26  
\double ..... 64  
double acute ( ⓘ) ..... *see* accents  
\doublebarwedge (☒) ..... 26  
\doublebarwedge (☒) ..... 24  
\doublecap ..... *see* \Cap  
\doublecap (∩) ..... 26  
\doublecap (∩) ..... 27  
\doublecup ..... *see* \Cup  
\doublecup (∪) ..... 26  
\doublecup (∪) ..... 27  
\doublecurlyvee (ව) ..... 27  
\doublecurlywedge (ව) ..... 27  
\doublefrown (⤵) ..... 55  
\doublefrown (⤵) ..... 55  
\doublepawns (օ) ..... 104  
\doublesmile (⌣) ..... 55  
\doublesmileeq (≣) ..... 55  
\doublesqcap (∩) ..... 27

\doubleesqcup (✉) . . . . .	26	\dsdtstile (█)	. . . . .	39	
\doubletilde (˜) . . . . .	18	dsfont (package) . . . . .	76, 130	\EM (↓) . . . . .	81
\doublevee (w) . . . . .	26	\dsheraldical (⊖) . . . . .	106	\Email (✉) . . . . .	82
\doublewedge (w) . . . . .	26	\dsjuridical (⚖) . . . . .	106	\Emailct (✉) . . . . .	82
\DOWNNarrow (▼) . . . . .	98	\dsliterary (⌚) . . . . .	106	\emptyset (∅) . . . . .	15
\Downarrow (⇓) . . . . .	47, 61	\dsmathematical (ѧ) . . . . .	106	\emptyset (∅) . . . . .	73
\Downarrow (⇓) . . . . .	50	\dsmedical (ѧ) . . . . .	106	\emptyset (∅) . . . . .	74
\downarrow . . . . .	123	\dsmilitary (⚔) . . . . .	106	\End ( [End] ) . . . . .	80
\downarrow (↓) . . . . .	47, 61	\dsrailways (🚠) . . . . .	106	end of proof . . . . .	73
\downarrow (↓) . . . . .	50	\dsststile (███)	. . . . .	\ending (⊥) . . . . .	104
\downarrowtail (↓) . . . . .	50	\dststile (██)	. . . . .	\eng (ŋ) . . . . .	14
\downbracketfill . . . . .	119	\dststile (██)	. . . . .	engineering symbols . . . . .	78, 82
\downdownarrows (↓↓) . . . . .	49	\dststile (███)	. . . . .	\engma (ŋ̥) . . . . .	15
\downdownarrows (↓↓) . . . . .	48	\dststile (███)	. . . . .	\ENQ (♣) . . . . .	81
\downdownarrows (↓↓) . . . . .	50	\dtbstile (███)	. . . . .	entails . . . . .	see \models
\downdownharpoons (↓↓) . . . . .	49	\dtbstile (███)	. . . . .	\Enter ( [Enter] ) . . . . .	80
Downes, Michael J. . . . .	56, 133	\dtbstile (███)	. . . . .	\Envelope (✉)	. . . . .
\downfilledspoon (↓) . . . . .	54	\dtbstile (███)	. . . . .	envelopes . . . . .	90, 109
\downfootline (↓) . . . . .	37	\dtbstile (███)	. . . . .	\enya (ɲ) . . . . .	15
\downfree (↓) . . . . .	37	\dtbstile (███)	. . . . .	\EOT (♦) . . . . .	81
\downharpoonccw (↓) . . . . .	53	\dtbstile (███)	. . . . .	epsdice (package) . . . . .	103, 130, 131
\downharpooncw (↓) . . . . .	53	\dtbstile (███)	. . . . .	\epsdice (█████████)	. . . . .
\downharpoonleft (↓) . . . . .	49	duodecimal (base-12) digits . . . . .	72	\epsi (ε) . . . . .	15
\downharpoonleft (↓) . . . . .	48	DVI . . . . .	21, 80, 120	\epsilon (ε) . . . . .	57
\downharpoonright (↓) . . . . .	49	\dz (đ) . . . . .	14	\epsilonup (ε) . . . . .	57
\downharpoonright (↓) . . . . .	48			\eqbump (↝) . . . . .	36
\downlsquigarrow (⤤) . . . . .	50			\eqbumped (↝) . . . . .	36
\downmapsto (⤣) . . . . .	50			\eqcirc (==) . . . . .	36
\downModels (⤏) . . . . .	37	e (esvect package option) . . . . .	68	\eqcirc (==) . . . . .	34
\downmodels (⤏) . . . . .	37	\e (e) . . . . .	59	\eqcirc (≈) . . . . .	36
\downnp (՞) . . . . .	20	\e (Ε) . . . . .	72	\Eqcolon (=:) . . . . .	35
\downparentfill . . . . .	119	ε-TeX . . . . .	61	\Eqcolon (=:) . . . . .	39
\downpitchfork (ψ) . . . . .	54	\Earth (⊕) . . . . .	79	\Eqcolon (=:) . . . . .	36
\downproto (՞) . . . . .	37	\Earth (δ) . . . . .	79	\Eqcolon (=:) . . . . .	36
\downrsquigarrow (⤤) . . . . .	50	\earth (δ) . . . . .	79	\Eqcolon (=:) . . . . .	39
\downslice (▽) . . . . .	28	\Ecommerce (㉿) . . . . .	20	\Eqcolon (=:) . . . . .	35
\downspoon (⤤) . . . . .	54	\EightAsterisk (✳) . . . . .	87	\Eqdot (.=) . . . . .	36
\downt (τ) . . . . .	20	\EightFlowerPetal (✳) . . . . .	87	\Eqfrown (⌿) . . . . .	55
\downtherefore (∴) . . . . .	26, 71	\EightFlowerPetalRemoved (✳)	. . . . .	\Eqcolon (=:) . . . . .	35
\downtouparrow (⤤) . . . . .	49	eight eighth note . . . . .	see musical symbols	\Eqcolon (=:) . . . . .	39
\downuparrows (↑↓) . . . . .	49	\eighthnote (♪) . . . . .	98	\Eqcolon (=:) . . . . .	35
\downuparrows (↓↑) . . . . .	50	\eighthnote (♪) . . . . .	98	\Eqcolon (=:) . . . . .	35
\downupharpoons (↓↓) . . . . .	49	\EightStar (✳) . . . . .	87	\Eqcolon (=:) . . . . .	39
\downupharpoons (↓↓) . . . . .	53	\EightStarBold (✳) . . . . .	87	\Eqcolon (=:) . . . . .	35
\downVdash (⊤) . . . . .	37	\EightStarConvex (✳) . . . . .	87	\Eqcolon (=:) . . . . .	35
\downvdash (⊤) . . . . .	37	\EightStarTaper (✳) . . . . .	87	\Eqcolon (=:) . . . . .	39
\downY (՞) . . . . .	26	\jective (՞) . . . . .	14	\Eqcolon (=:) . . . . .	35
dozenal (package) . . . . .	72, 130	electrical symbols . . . . .	78	\Eqcolon (=:) . . . . .	39
dozenal digits . . . . .	72	electromotive force (ℰ) . . . . .	see alphabets, math	\Eqcolon (=:) . . . . .	35
\dracma (ℳ) . . . . .	21	element of . . . . .	see \in	\Eqcolon (=:) . . . . .	35
\drsh (↳) . . . . .	49	\ell (ℓ) . . . . .	59	\Eqcolon (=:) . . . . .	41
\DS (฿) . . . . .	99	\Ellipse (○) . . . . .	89	\Eqcolon (=:) . . . . .	41
\Ds (฿) . . . . .	99	ellipses (dots) . . . . .	10, 70–73, 117	\Eqcolon (=:) . . . . .	41
\dsaeronautical (܂) . . . . .	106	ellipses (ovals) . . . . .	89	\Eqcolon (=:) . . . . .	41
\dsagricultural (܂) . . . . .	106	\EllipseShadow (○) . . . . .	89	\Eqcolon (=:) . . . . .	23, 118
\dsarchitectural (܂) . . . . .	106	\EllipseSolid (●) . . . . .	89	equidecomposable . . . . .	114
\dsbiological (܂) . . . . .	106			equilibrium . . . . .	see \rightleftharpoons
\dschemical (܂) . . . . .	106				
\dscommercial (܂) . . . . .	106				

\equiv (≡) . . . . .	23, 34	\feyn{hs} („) . . . . .	83
\equiv (≡) . . . . .	37	\feyn{hu} (↗) . . . . .	83
equivalence . . . . .	<i>see</i> \equiv, \leftrightarrow, and \threesim	\feyn{h} („) . . . . .	83
\equivclosed (≡) . . . . .	37	\feyn{ms} (≡) . . . . .	83
\er (ø) . . . . .	14	\feyn{m} (≡) . . . . .	83
es-zet . . . . .	<i>see</i> \ss	\feyn{P} (●) . . . . .	83
\ESC (←) . . . . .	81	\feyn{p} (◐) . . . . .	83
\Esc (Esc) . . . . .	80	\feyn{x} (◐) . . . . .	83
escapable characters . . . . .	10	\FF (♀) . . . . .	81
\esh (ʃ) . . . . .	14	fge (package) . . . . .	54, 60, 65, 72, 75, 130, 131
\esh (ʃ) . . . . .	15	fge-digits . . . . .	72
esint (package) . . . . .	32, 130	\fgeA (Ⓐ) . . . . .	60
\Estatically (▲) . . . . .	82	\fgebackslash (＼) . . . . .	75
estimated . . . . .	<i>see</i> \textestimated	\fgebaracute (܂) . . . . .	75
esvect (package) . . . . .	68, 130	\fgebarcap (܂) . . . . .	75
\eta (η) . . . . .	57	\fgec (܂) . . . . .	60
\etaup (η) . . . . .	57	\fgecap (܂) . . . . .	75
\ETB (߁) . . . . .	81	\fgecapbar (܂) . . . . .	75
\eth (߁) . . . . .	73	\fgecup (܂) . . . . .	75
\eth (߁) . . . . .	14	\fgecupacute (܂) . . . . .	75
\eth (߁) . . . . .	15	\fgecupbar (܂) . . . . .	75
\ETX (♥) . . . . .	81	\fged (܂) . . . . .	60
eufrak (package) . . . . .	76	\fgee (܂) . . . . .	60
Euler Roman . . . . .	58	\fgeeszett (܂) . . . . .	60
\EUR (€) . . . . .	20	\fgeeta (܂) . . . . .	60
\EURcr (€) . . . . .	20	\fgef (܂) . . . . .	60
\EURdig (€) . . . . .	20	\fgeinfinity (܂) . . . . .	75
\EURhv (€) . . . . .	20	\fgelangle (܂) . . . . .	75
\Euro (€) . . . . .	21	\fgelb . . . . .	60
\euro . . . . .	21	\fgelb (܂) . . . . .	60
euro signs . . . . .	20, 21	\fgeleftB (܂) . . . . .	60
blackboard bold . . . . .	76	\fgeleftC (܂) . . . . .	60
\eurologo (€) . . . . .	21	\fgeN (܂) . . . . .	60
eurosym (package) . . . . .	21, 130, 131	\fgeoverU (܂) . . . . .	60
\EURtm (€) . . . . .	20	\fgerightarrow (܂) . . . . .	54
euscript (package) . . . . .	76, 130	\fgerightB (܂) . . . . .	60
evaluated at . . . . .	<i>see</i> \vert	\fges (܂) . . . . .	60
evil spirits . . . . .	108	\fgestruckone (܂) . . . . .	72
exclusive disjunction . . . . .	<i>see</i> \leftrightarrow \nequiv, and \oplus	\fgestruckzero (܂) . . . . .	72
exclusive or . . . . .	113	\fgeU (܂) . . . . .	60
\exists (Ǝ) . . . . .	59	\fgeuparrow (܂) . . . . .	54
\exists (Ǝ) . . . . .	59	\fgeupbracket (܂) . . . . .	75
\exists (Ǝ) . . . . .	59	\FHBOLogo (܂) . . . . .	101
\exp (exp) . . . . .	56	\FHBologo (܂) . . . . .	101
\Explosionsafe (܂) . . . . .	82	field (F) . . . . .	<i>see</i> alphabets, math
extarrows (package) . . . . .	69, 130, 131	\file (⇒) . . . . .	104
extensible accents . . . . .	66–68, 70, 118–119	\FilledBigCircle (●) . . . . .	89
extensible arrows . . . . .	66–70	\FilledBigDiamondshape (◆) . . . . .	89
extensible symbols, creating . . . . .	118– 119	\FilledBigSquare (■) . . . . .	89
extensible tildes . . . . .	66, 68	\FilledBigTriangleDown (▼) . . . . .	89
extension characters . . . . .	55, 56	\FilledBigTriangleLeft (◀) . . . . .	89
extpfeil (package) . . . . .	70, 130, 131	\FilledBigTriangleRight (▶) . . . . .	89
		\FilledBigTriangleUp (▲) . . . . .	89
		\FilledCircle (●) . . . . .	89
		\FilledCloud (܂) . . . . .	101

\filleddiamond (◆) . . . . .	28	\fint (ƒ) . . . . .	32
\FilledDiamondShadowA (◆)	89	\Finv (⌁) . . . . .	59
\FilledDiamondShadowC (◆)	89	\Finv (⌂) . . . . .	59
\FilledDiamondshape (◆)	89	\Fire (🔥) . . . . .	102
\FilledHut (🎩) . . . . .	102	fish hook . . . . .	see \strictif
\filledlargestar (★) . . . . .	88	fists . . . . .	85
\filledlozenge (◆) . . . . .	88	\fivedots (⋮) . . . . .	26, 71
\filledmedlozenge (◆) . . . . .	88	\FiveFlowerOpen (❖) . . . . .	87
\filledmedsquare (■) . . . . .	28	\FiveFlowerPetal (❖) . . . . .	87
\filledmedtriangledown (▼) . . . . .	28, 47	\FiveStar (★) . . . . .	87
\filledmedtriangleleft (◀) . . . . .	28, 47	\FiveStarCenterOpen (☆) . . . . .	87
\filledmedtriangleright (▶) . . . . .	28, 47	\FiveStarConvex (☆) . . . . .	87
\filledmedtriangleup (▲) . . . . .	28, 47	\FiveStarLines (☆) . . . . .	87
\FilledRainCloud (🌧) . . . . .	101	\FiveStarOpen (☆) . . . . .	87
\FilledSectioningDiamond (❖)	102	\FiveStarOpenCircled (❖) . . . . .	87
\FilledSmallCircle (●) . . . . .	89	\FiveStarOpenDotted (★) . . . . .	87
\FilledSmallDiamondshape (◆) . . . . .	89	\FiveStarOutline (☆) . . . . .	87
\FilledSmallSquare (■) . . . . .	89	\FiveStarOutlineHeavy (★) . . . . .	87
\FilledSmallTriangleDown (▼) . . . . .	89	\FiveStarShadow (☆) . . . . .	87
\FilledSmallTriangleLeft (◀) . . . . .	89	\Fixedbearing (⤳) . . . . .	82
\FilledSmallTriangleRight (▶) . . . . .	89	\fixedddots (⋮⋮) . . . . .	70
\FilledSmallTriangleUp (▲) . . . . .	89	\fixedvdots (⋮) . . . . .	70
\FilledSnowCloud (🌨) . . . . .	101	fixmath (package) . . . . .	124
\FilledSquare (■) . . . . .	89	\fj (ƒj) . . . . .	15
\filledsquare (■) . . . . .	28	\Flag (⚑) . . . . .	102
\FilledSquareShadowA (■)	89	\flap (ƒ) . . . . .	15
\FilledSquareShadowC (■)	89	\flapr (ƒ) . . . . .	14
\filledsquarewithdots (❖)	90	\flat (♭) . . . . .	73, 98
\filledstar (★) . . . . .	28	\flat (♭) . . . . .	74
\FilledSunCloud (☀) . . . . .	101	\Flatsteel (▬) . . . . .	82
\FilledTriangleDown (▼) . . . . .	89	fletched arrows . . . . .	54, 84
\filledtriangledown (▼) . . . . .	28, 47	fleurons . . . . .	88, 90
\FilledTriangleLeft (◀) . . . . .	89	florin . . . . .	see \textflorin
\filledtriangleleft (◀) . . . . .	28, 47	\floweroneleft (✿) . . . . .	88
\FilledTriangleRight (▶) . . . . .	89	\floweroneright (✿) . . . . .	88
\filledtriangleright (▶) . . . . .	28, 47	flowers . . . . .	87, 88
\FilledTriangleUp (▲) . . . . .	89	Flynn, Peter . . . . .	114
\filledtriangleup (▲) . . . . .	28, 47	\Fog (🌫) . . . . .	101
\FilledWeakRainCloud (🌧)	101	font encodings . . . . .	
finger, pointing . . . . .	see fists	Latin 1 . . . . .	130
finite field (F) . . . . .	see alphabets, math	font encodings . . . . .	9, 124, 126
\finpartvoice (♫) . . . . .	18	7-bit . . . . .	9
\finpartvoiceless (Ӯ) . . . . .	18	8-bit . . . . .	9
\fint (ƒ) . . . . .	31	ASCII . . . . .	130
		document . . . . .	126
		limiting scope of . . . . .	9
		LY1 . . . . .	9
		OT1 . . . . .	9, 11, 16, 118, 124–126
		OT2 . . . . .	113
		T1 . . . . .	9, 11, 16, 125, 126
		T4 . . . . .	11, 15, 16, 19
		T5 . . . . .	11, 16
		TS1 . . . . .	126
		fontdef.dtx (file) . . . . .	113, 117
		fontenc (package) . . . . .	9, 11, 16, 126
		\fontencoding . . . . .	9
		fonts . . . . .	
		Calligra . . . . .	76
		Charter . . . . .	20, 33
		Computer Modern . . . . .	110, 112, 125
		Courier . . . . .	20
		Garamond . . . . .	20, 33
		Helvetica . . . . .	20
		Symbol . . . . .	58, 113
		Times Roman . . . . .	20, 112
		Type 1 . . . . .	122, 123
		Utopia . . . . .	20, 33
		Zapf Chancery . . . . .	76
		Zapf Dingbats . . . . .	84, 87
		\fontsize . . . . .	110, 112
		\fontspec (package) . . . . .	129
		\Football (🏈) . . . . .	100
		\forall (∀) . . . . .	59
		\forallall ( ∀) . . . . .	59
		\Force (⤵) . . . . .	82
		\Forward (▶) . . . . .	100
		\ForwardToEnd (▶) . . . . .	100
		\ForwardToIndex (▶) . . . . .	100
		\FourAsterisk (❖) . . . . .	87
		\FourClowerOpen (❖) . . . . .	87
		\FourClowerSolid (❖) . . . . .	87
		\Fourier (—○) . . . . .	40
		fourier (package) . . . . .	21, 41, 58, 60, 64, 68, 85, 88, 101, 130
		\fourier (○—) . . . . .	40
		Fourier transform (ℱ) . . . . .	see alphabets, math
		\FourStar (◆) . . . . .	87
		\FourStarOpen (❖) . . . . .	87
		\fourth (☰) . . . . .	73
		fractions . . . . .	74
		fraktur . . . . .	see alphabets, math
		Freemason's cipher . . . . .	108
		Frege logic symbols . . . . .	54, 60, 72, 75
		\frown (¬) . . . . .	34
		\frown (¬) . . . . .	55
		frown symbols . . . . .	55
		\frowneq (⊉) . . . . .	55
		\frowneqsmile (⊌) . . . . .	55
		\frownie (⊖) . . . . .	98
		\frownsmile (⊒) . . . . .	55
		\frownsmileeq (⊑) . . . . .	55
		\Frowny (⊖) . . . . .	101
		frowny faces . . . . .	81, 98, 101
		\FS (↳) . . . . .	81
		\FullFHBO (Fullscreen) . . . . .	101
		\fullmoon (>O) . . . . .	79
		\fullmoon (O) . . . . .	79
		\fullnote (.) . . . . .	98



\Hc (ſ) . . . . .	92	\Hm (ѧ) . . . . .	92	\HU (Ը) . . . . .	92
\hcrossing (×) . . . . .	37	\Hman (Յ) . . . . .	92	\Hu (՞) . . . . .	92
\HCthousand (Գ) . . . . .	92	\Hmillion (Յ) . . . . .	92	Hungarian umlaut (՞) <i>see</i> accents	
\HD (՞) . . . . .	92	\Hms (Յ) . . . . .	92	\Hut (Շ) . . . . .	102
\Hd (՞) . . . . .	92	\HN (՞) . . . . .	92	\HV (Ջ) . . . . .	92
\hdotdot (↔) . . . . .	26, 71	\Hn (՞) . . . . .	92	\Hv (Վ) . . . . .	92
\hdots (...) . . . . .	71	\HO (Օ) . . . . .	92	\hv (Խ) . . . . .	14
\Hdual (՞) . . . . .	92	\Ho (՞) . . . . .	92	\Hvbar (Ւ) . . . . .	92
\HE (Ե) . . . . .	92	Holt, Alexander . . . . .	1, 129	\HW (Յ) . . . . .	92
\He (՞) . . . . .	92	\holter (ՀՈԼՏԵՐ) . . . . .	70	\Hw (Ձ) . . . . .	92
heads . . . . . <i>see</i> faces		holtpolt (package) . . . . .	70, 130	\HX (Ճ) . . . . .	92
\Heart (♡) . . . . .	101	\hom (hom) . . . . .	56	\Hx (Ջ) . . . . .	92
hearts (suit) . . . . .	73–75, 90	\Home (ՀՈՄԵ) . . . . .	80	\HXthousand (Ժ) . . . . .	92
\heartsuit (♡) . . . . .	73			\HY (Յ) . . . . .	92
\heartsuit (♡) . . . . .	74	\Homer (ՀՈՄԵՐ) . . . . .	106	\Hy (Ջ) . . . . .	92
Hebrew . . . . .	58, 76	\Hone (ի) . . . . .	92	hyphen, discretionary . . . . .	126
Helvetica (font) . . . . .	20	hook accent (՞) . . . . . <i>see</i> accents		\HZ (Բ) . . . . .	92
\hemibelion (c) . . . . .	21	\hookb (՞) . . . . .	14	\Hz (՞) . . . . .	92
\HERMAPHRODITE (⚥) . . . . .	82	\hookd (՞) . . . . .	14		
\Hermaphrodite (⚥) . . . . .	82	\hookd (՞) . . . . .	15		
\hexagon (օ) . . . . .	88	\hookdownminus (՞) . . . . .	74		
\Hexasteel (●) . . . . .	82	\hookg (՞) . . . . .	14		
\hexstar (*) . . . . .	87	\hookh (՞) . . . . .	14		
\HF (F) . . . . .	78	\hookheng (՞) . . . . .	14		
\HF (՞) . . . . .	92	\hookleftarrow (՞) . . . . .	47		
\Hf (՞) . . . . .	92	\hookleftarrow (՞) . . . . .	51		
\hfermion (_) . . . . .	83	\hookrevepsilon (՞) . . . . .	14		
\hfil . . . . .	115	\hookrightarrow (՞) . . . . .	47		
\HG (▽) . . . . .	92	\hookrightarrow (՞) . . . . .	51		
\Hg (¤) . . . . .	92	\hookupminus (՞) . . . . .	74		
\HH . . . . .	99	Horn, Berthold . . . . .	77		
\HH (՚) . . . . .	92	\HP (՞) . . . . .	92		
\Hh (՛) . . . . .	92	\Hp (՞) . . . . .	92		
hhcount (package) . . . . .	103, 130, 132	\Hplural (՞) . . . . .	92		
\Hhundred (՞) . . . . .	92	\Hplus (†) . . . . .	92		
\HI (՚) . . . . .	92	\HQ (՞) . . . . .	92		
\Hi (՚) . . . . .	92	\Hq (՞) . . . . .	92		
\hiatus (՚) . . . . .	106	\Hquery (՞) . . . . .	92		
\Hibl (՚) . . . . .	92	\HR (՞) . . . . .	92		
\Hibp (՚) . . . . .	92	\Hr (՞) . . . . .	92		
\Hibs (՚) . . . . .	92	\HS (՞) . . . . .	92		
\Hibw (՚) . . . . .	92	\Hs (՚) . . . . .	92		
hierogl (package) . . . . .	92, 130, 131	\Hscribe (՚) . . . . .	92		
hieroglyphics . . . . .	92	\Hslash (՚) . . . . .	92		
Hilbert space (՚) <i>see</i> alphabets, math		\hslashash (՞) . . . . .	59		
\hill (՞) . . . . .	18	\Hsv (՞) . . . . .	92		
\HJ (՚) . . . . .	92	\HT (՞) . . . . .	92		
\Hj (՞) . . . . .	92	\HT (օ) . . . . .	81		
\HK (՚) . . . . .	92	\Ht (՞) . . . . .	92		
\Hk (՞) . . . . .	92	\Hten (՞) . . . . .	92		
\hksqrt (√՞) . . . . .	116	\Hthousand (՚) . . . . .	92		
\HL (՚) . . . . .	92	\Htongue (՚) . . . . .	92		
\Hl (՞) . . . . .	92				
\HM (՞) . . . . .	92				

\iiint (fff)	32	\intercal ( $\tau$ )	24	\Joch (()	102
\iiint (fff)	32	\intercal ( $\tau$ )	59	\Join ( $\bowtie$ )	34, 35
\iint (ff)	30	\interleave (   )	25	\Join ( $\bowtie$ )	27
\iint (ff)	29	intersection	<i>see</i> \cap	\joinrel	113
\iint (ff)	29, 31	\Interval (⌚)	102	joint denial	<i>see</i> \downarrowarrow
\iint (ff)	32	\inva (e)	14	\junicode (package)	129
\iint (ff)	32	\invamp (ꝧ)	25	\Junicode-Regular.ttf (file)	129
\Im (S)	59	\invbackneg (⊣)	74	\Jupiter (ꝣ)	79
\im (j)	59	\INVd (○)	81	\Jupiter (Ꝥ)	79
\imath (i)	59, 65	\invdiameter (ꝧ)	98	\jupiter (ꝥ)	79
\impliedby .	<i>see</i> \Longleftarrow	\inve (e)	14		
\implies .	<i>see</i> \Longrightarrow and \vdash	inverse limit	<i>see</i> \varprojlim		
impulse train		\InversTransformHoriz (•○)	40		
\in (ε)	59	\InversTransformVert (●)	40		
\in (ε)	59	inverted symbols	12–15, 19, 113		
\in (ε)	60	inverters	81		
\in (ε)	59	\invf (j)	14		
inches	<i>see</i> \second and \textquotedbl	\invglotstop (b)	14		
\incoh (≈)	40	\invh (ꝫ)	14		
independence		\INVl (○)	81		
probabilistic	116	\invlegr (l)	14		
statistical	116	\invnm (uu)	14		
stochastic	<i>see</i> \bot	\invneg (¬)	35		
\independent (⊤)	116	\invneg (¬)	74		
\Industry (▣)	100	\INVr (○)	81		
inequalities	10, 42–45	\invr (i)	14		
inexact differential	<i>see</i> \dbar	\invscr (k)	14		
\inf (inf)	56	\invscripta (v)	14		
infimum	<i>see</i> \inf and \sqcup	\INVu (△)	81		
infinity (∞)	<i>see</i> \infty	\invv (Λ)	14		
\Info (i)	109	\invw (ℳ)	14		
\Info (II)	100	\invy (Δ)	14		
information symbols	100	\iotaota (i)	57		
informator symbols	104	iota, upside-down	113		
\infty (∞)	73	\iotaautp (i)	57		
\infty (∞)	73	\ipagamma (y)	14		
\infty (∞)	74	\ipercatal (⊕)	106		
\inipartvoice (▣)	18	\IroningI (⤠)	100		
\inipartvoiceless (▣)	18	\IroningII (⤡)	100		
\injlim (inj lim)	56	\IroningIII (⤢)	100		
\inplus (⊕)	34	irony mark (՞)	113		
inputenc (package)	128	irrational numbers (J)	<i>see</i>		
\Ins ([Ins])	80	alphabets, math			
\int (ʃ)	30	\Irritant (✗)	102	\Lambda (Λ)	57
\int (ʃ)	29	\ismodeledby (= )	114	\lambda (λ)	57
\int (ʃ)	29	ISO character entities	126	\lambdaambabar (⤠)	73
\int (ʃ)	32	isoent (package)	126	\lambdaambdaslash (⤠)	73
\intclockwise (ʃ)	33			\lambdaambdaup (λ)	57
\INTEGER (Z)	56			Lamport, Leslie	129, 133
\Integer (Z)	56			\land	<i>see</i> \wedge
integers (Z)	<i>see</i> alphabets, math			\landdownint (ʃ)	32
integrals	29–33, 74, 116			\landdownint (ʃ)	32
integrals (wasysym package option)				\landupint (ʃ)	32
	29			\landupint (ʃ)	32
				\Langl (⟨)	76
				\Langl (⟨)	64

\langle ()	23, 61	\lcirclearightint (ƒ)	32	\leftmapsto (↔)	50
\langle (⟨)	62	\lcm (lcm)	123	\leftModels (≡l)	37
\langlebar (⟨)	62	\lcorners (⊜)	60	\leftmodels (≡)	37
\Laplace (●—○)	40	\lcurvearrowdown (⤒)	50	\leftmoon (⌚)	79
\laplace (○—●)	40	\lcurvearrowleft (⤑)	50	\leftmoon (⌚)	79
Laplace transform (ℒ)	see alphabets, math	\lcurvearrowne (⤓)	50	\leftp (⌚)	20
Laplacian (Δ)	see \Delta	\lcurvearrownw (⤔)	50	\leftpitchfork (⊣)	54
Laplacian ( $\nabla^2$ )	see \nabla	\lcurvearrowright (⤖)	50	\leftpointright (⌚)	85
\largecircle (○)	88	\lcurvearrowse (⤗)	50	\leftproto (∞)	37
\argediamond (◇)	88	\lcurvearrowsw (⤘)	50	\Leftrightarrow (↔)	47
\largepentagon (◇)	88	\lcurvearrowup (⤙)	50	\Leftrightarrow (↔)	50
\largepencil (铅笔)	85	\ldbrack (⟦)	62	\leftrightarrow (↔)	49
\largepentagram (☆)	88	\ldotp (.)	70	\leftrightarrow (↔)	47
\large square (□)	88	\ldots (...)	70	\leftrightarrow (↔)	50
\largestar (☆)	88	\le	see \leq	\leftrightarroweq (⇒)	48
\largestarofdavid (✡)	88	\leadsto (↝)	35, 47	\leftrightarrows (↔)	49
\largetriangleleft (◁)	47	\leadsto (↝)	51	\leftrightarrows (↔)	48
\largetriangleleft (▷)	47	leaf	see \textleaf	\leftrightarrows (↔)	50
\largetriangleup (△)	47	\leafleft (⤠)	88	\leftrightarrowtriangle (↔)	48
\LArrow (⤠)	80	\leafNE (⤡)	88	\leftrightharpoon (⤠)	49
\arrowfill	69	\leafright (⤢)	88	\leftrightharpoondownup (⤣)	53
\Laserbeam (激光)	82	leaves	88, 90	\leftrightharpoons (⤤)	49
LaTeX	1, 9, 16, 29, 34, 56, 61, 70, 73, 81, 84, 110, 113–120, 123, 125, 126, 128–130, 132, 133	Lefschetz motive (ℒ)	see alphabets, math	\leftrightharpoons (⤤)	48
LaTeX 2 $\varepsilon$	1, 9, 10, 21, 22, 24, 34, 41, 47, 66, 70, 73, 77, 81, 110, 111, 113, 116, 117, 122–128, 133	\Left	106	\leftrightharpoons (⤤)	53
latexsym (package)	24, 34, 41, 47, 73, 110, 130	\left	61, 63, 64, 110, 112	\leftrightharpoonsfill	69
\latfric (‡)	14	\LEFTarrow (⤠)	98	\leftrightharpoonupdown (⤣)	53
Latin 1	9, 125–126, 130	\Leftarrow (⇐)	23, 47	\leftrightharpline (⤤)	37
table	127	\Leftarrow (⇐)	50	\leftrightharline (⤤)	37
laundry symbols	100	\leftarrow (←)	49	\leftrightsquigarrow (⤧⤧)	49
\Lbag (⦵)	60	\leftarrow (←)	47	\leftrightsquigarrow (⤧⤧)	48
\lbag (⦵)	60	\leftarrow (←)	50	\leftrightsquigarrow (⤠)	51
\lbrace (⦵)	62	\leftarrowtail (⤠⤠)	48	\leftarrowtail (⤠⤠)	50
\Lbrack (⟦)	76	\leftarrowtail (⤠⤠)	50	\Leftscissors (⤠)	84
\lBrack (⟦)	64	\leftarrowtriangle (⤠)	48	\leftslice (⤠)	25
LCD digits	78	\leftbarharpoon (⤤)	49	\leftslice (⤠)	37
\lCeil (⦶)	64	\LEFTCIRCLE (⦿)	98	\leftspoon (⤠)	54
\lceil (⌈)	61	\LEFTcircle (⦿)	98	\leftsquigarrow (⤧⤧)	49
\lceil (⌈)	62	\Leftcircle (⦿)	98	\leftsquigarrow (⤧⤧)	49
\lceil (⌈)	62	\leftevaw (⤠)	63	\leftt (⤠)	20
\lcirclearrowdown (⤒)	50	\leftfilledspoon (⤠)	54	\lefttherefore (⋮)	26, 71
\lcirclearrowleft (⤑)	50	\leftfootline (⤠)	37	\leftthreetimes (⤠)	73
\lcirclearrowright (⤖)	50	\leftfree (⤠)	37	\leftthreetimes (⤠)	24
\lcirclearrowup (⤔)	50	\lefthalfcap (⤠)	26	\leftthreeshort (⤠)	26
\lcircleleftint (ƒ)	32	\lefthalfcup (⤠)	26	\leftthumbsdown (⤠)	85
\leftharpoonup (⤠)	49	\lefthand (⤠)	85	\leftthumbsup (⤠)	85
\leftharpoonup (⤠)	48	\leftharpoonccw (⤠)	53	\lefttorightarrow (⤠)	49
\leftharpoonup (⤠)	48	\leftharpooncw (⤠)	53	\lefttorque (⤠)	82
\leftharpoonup (⤠)	49	\leftharpoondown (⤠)	49	\leftturn (⤠)	98
\leftharpoonup (⤠)	48	\leftharpoonup (⤠)	49	\leftVdash (⤠)	37
\leftharpoonup (⤠)	49	\leftharpoonup (⤠)	48	\leftvdash (⤠)	37
\leftharpoonup (⤠)	49	\leftharpoonup (⤠)	49	\leftwave (⤠)	63
\leftharpoonup (⤠)	48	\leftharpoonup (⤠)	48	\leftY (⤠)	26
\leftharpoonup (⤠)	49	\leftleftarrows (⤠⤠)	49	legal symbols	10, 21, 127
\leftleftarrows (⤠⤠)	48	\leftleftarrows (⤠⤠)	48	\legm (w)	14
\leftleftarrows (⤠⤠)	50	\leftleftarrows (⤠⤠)	50	\legr (r)	14
\leftleftarrows (⤠⤠)	49	\leftleftharpoons (⤠⤠)	49	\length (l)	20
\leftleftharpoons (⤠⤠)	50	\leftleftharpoons (⤠⤠)	50	\Leo (Q)	79

\leo (⌚)	79
\leq (≤)	44
\leq (≤)	42, 44
\leq (≤)	45
\leqclosed (≤)	45, 47
\leqdot (≤)	45
\leqq (≤)	44
\leqq (≤)	43
\leqq (≤)	45
\leqslant (≤)	43
\leqslant (≤)	45
\leqslantdot (≤)	45
\less (<)	45
less-than signs	<i>see</i> inequalities
\lessapprox (≈)	44
\lessapprox (≈)	43
\lessapprox (≈)	45
\lessdot (≤)	45, 47
\lessdot (≤)	44
\lessdot (≤)	43
\lessdot (≤)	45
\lesseqgtr (≥)	44
\lesseqgtr (≥)	43
\lesseqgtr (≥)	45
\lesseqgtr (≥)	45
\lesseqgtrslant (≥)	45
\lesseqgtr (≥)	44
\lesseqgtr (≥)	43
\lesseqgtr (≥)	45
\lesseqgtr (≥)	45
\lesseqgtr (≥)	45
\lessneqqgtr (≥)	45
\lesssim (≤)	44
\lesssim (≤)	43
\lesssim (≤)	45
\lesssim (≤)	45
\Letter (✉)	102
\Letter (✉ vs. ✉)	111
\Letter (✉)	82
letter-like symbols	59, 60
letters	<i>see</i> alphabets
barred	114
non-ASCII	11
slashed	115
variant Latin	58
\levaw (⌚)	63
\LF (⌚)	81
\lfilet (⌚)	62
\lfloor (⌋)	64
\lfloor (⌊)	61
\lfloor (⌋)	62
\lg (lg)	56
\lgroup (⟨)	61
\lgroup (⟨)	62
\lhd (◀)	25
\lhd (◀)	24, 25
\lhd (◀)	45, 47
\lhd bend (⤵)	99
\lhookdownarrow (⤴)	50
\lhookleftarrow (⤶)	51
\lhooknearrow (⤷)	51
\lhooknarrow (⤸)	51
\lhookrightarrow (⤹)	51
\lhooksearrow (⤸)	51
\lhookswarrow (⤸)	51
\lhookuparrow (⤵)	51
\Libra (♎)	79
\libra (♎)	79
Lie derivative ( $\mathcal{L}$ )	<i>see</i> alphabets, math
life-insurance symbols	118
\lightbulb (💡)	122
lightbulb.mf (file)	120, 121
lightbulb.sty (file)	122, 123
lightbulb10.2602gf (file)	120
lightbulb10.dvi (file)	120
lightbulb10.mf (file)	120–122
lightbulb10.tfm (file)	122
\Lightning (⚡ vs. ⚡)	111
\Lightning (⚡)	101
\Lightning (⚡)	82
\lightning (⚡)	48
\lightning (⚡ vs. ⚡)	111
\lightning (⚡)	51
\lightning (⚡)	98
\lim (lim)	56, 123
\liminf (lim inf)	56, 123
limits	56
\limsup (lim sup)	56, 123
\linbfamily	95, 96
Linear A	92
Linear B	95, 96
linear implication	<i>see</i> \multimap
linear logic symbols	23–25, 28, 29, 32–33, 40, 59
linearA (package)	92, 130, 131
\LinearAC ( ⓘ)	92
\LinearACC ( ⓘ)	92
\LinearACCC ( ⓘ)	92
\LinearACCI ( ⓘ)	92
\LinearACCCII ( ⓘ)	92
\LinearACCCIII ( ⓘ)	92
\LinearACCCIV ( ⓘ)	92
\LinearACCCIX ( ⓘ)	93
\LinearACCCX ( ⓘ)	93
\LinearACCCXI ( ⓘ)	93
\LinearACCCXII ( ⓘ)	93
\LinearACCCXIII ( ⓘ)	93
\LinearACCCXIV ( ⓘ)	93
\LinearACCCXIX ( ⓘ)	93
\LinearACCCXL ( ⓘ)	93
\LinearACCCXLI ( ⓘ)	93
\LinearACCCXLII ( ⓘ)	93
\LinearACCCXLIII ( ⓘ)	93
\LinearACCCXLIV ( ⓘ)	93
\LinearACCCXLV ( ⓘ)	93
\LinearACCCXLVI ( ⓘ)	93
\LinearACCCXLVII ( ⓘ)	93
\LinearACCCXLVIII ( ⓘ)	93
\LinearACCCXV ( ⓘ)	93
\LinearACCCXVI ( ⓘ)	93
\LinearACCCXVII ( ⓘ)	93
\LinearACCCXVIII ( ⓘ)	93
\LinearACCCXIX ( ⓘ)	93

\LinearACCCXXI (✉)	93	\LinearACCLXXXIX (✉)	94	\LinearACCXXXVIII (✉)	93
\LinearACCCXXII (✉)	93	\LinearACCLXXXV (✉)	94	\LinearACI (✉)	92
\LinearACCCXXIII (✉)	93	\LinearACCLXXXVI (✉)	94	\LinearACII (✉)	92
\LinearACCCXXIV (✉)	93	\LinearACCLXXXVII (✉)	94	\LinearACIII (✉)	92
\LinearACCCXXIX (✉)	93	\LinearACCLXXXVIII (✉)	94	\LinearACIV (✉)	92
\LinearACCCXXV (✉)	93	\LinearACCLXXX (✉)	94	\LinearACIX (✉)	93
\LinearACCCXXVI (✉)	93	\LinearACCV (✉)	92	\LinearACL (✉)	93
\LinearACCCXXVII (✉)	93	\LinearACCVI (✉)	93	\LinearACLI (✉)	93
\LinearACCCXXVIII (✉)	93	\LinearACCVII (✉)	93	\LinearACLII (✉)	93
\LinearACCCXXIX (✉)	93	\LinearACCVIII (✉)	93	\LinearACLIII (✉)	93
\LinearACCCXXXI (✉)	93	\LinearACCX (✉)	93	\LinearACLIV (✉)	93
\LinearACCCXXXII (✉)	93	\LinearACCXI (✉)	94	\LinearACLIX (✉)	94
\LinearACCCXXXIII (✉)	93	\LinearACCXII (✉)	94	\LinearACLV (✉)	93
\LinearACCCXXXIV (✉)	93	\LinearACCXIII (✉)	94	\LinearACLVI (✉)	93
\LinearACCCXXXIX (✉)	93	\LinearACCXIV (✉)	94	\LinearACLVII (✉)	94
\LinearACCCXXXV (✉)	93	\LinearACCXIX (✉)	92	\LinearACLVIII (✉)	94
\LinearACCCXXXVI (✉)	93	\LinearACCXCV (✉)	92	\LinearACLX (✉)	94
\LinearACCCXXXVII (✉)	93	\LinearACCXCVI (✉)	92	\LinearACLXI (✉)	94
\LinearACCCXXXVIII (✉)	93	\LinearACCXCVII (✉)	92	\LinearACLXII (✉)	94
\LinearACCI (✉)	92	\LinearACCXCVIII (✉)	92	\LinearACLXIII (✉)	94
\LinearACCI (✉)	92	\LinearACCXI (✉)	93	\LinearACLXIV (✉)	94
\LinearACCII (✉)	92	\LinearACCXII (✉)	93	\LinearACLXIX (✉)	94
\LinearACCIII (✉)	92	\LinearACCXIII (✉)	93	\LinearACLXV (✉)	94
\LinearACCIV (✉)	92	\LinearACCXIV (✉)	93	\LinearACLXVI (✉)	94
\LinearACCIX (✉)	93	\LinearACCXIX (✉)	93	\LinearACLXVII (✉)	94
\LinearACCL (✉)	93	\LinearACCXL (✉)	93	\LinearACLXVIII (✉)	94
\LinearACCLI (✉)	93	\LinearACCXLII (✉)	93	\LinearACLXX (✉)	94
\LinearACCLI (✉)	93	\LinearACCXLIII (✉)	93	\LinearACLXXI (✉)	94
\LinearACCLI (✉)	93	\LinearACCXLIV (✉)	93	\LinearACLXXII (✉)	94
\LinearACCLI (✉)	93	\LinearACCXLIX (✉)	93	\LinearACLXXIII (✉)	94
\LinearACCLVI (✉)	94	\LinearACCXLV (✉)	93	\LinearACLXXIV (✉)	94
\LinearACCLVII (✉)	94	\LinearACCXLVI (✉)	93	\LinearACLXXIX (✉)	94
\LinearACCLVIII (✉)	94	\LinearACCXLVII (✉)	93	\LinearACLXXV (✉)	94
\LinearACCLX (✉)	94	\LinearACCXLVIII (✉)	93	\LinearACLXXVI (✉)	94
\LinearACCLXI (✉)	94	\LinearACCX (✉)	93	\LinearACLXXVII (✉)	94
\LinearACCLXII (✉)	94	\LinearACCXI (✉)	93	\LinearACLXXVIII (✉)	94
\LinearACCLXIII (✉)	94	\LinearACCXII (✉)	93	\LinearACLXXX (✉)	94
\LinearACCLXIV (✉)	94	\LinearACCXIII (✉)	93	\LinearACLXXXI (✉)	94
\LinearACCLXIX (✉)	94	\LinearACCXIV (✉)	93	\LinearACLXXXII (✉)	94
\LinearACCLXV (✉)	94	\LinearACCXVI (✉)	93	\LinearACLXXXIII (✉)	94
\LinearACCLXVI (✉)	94	\LinearACCXVII (✉)	93	\LinearACLXXXIV (✉)	94
\LinearACCLXVII (✉)	94	\LinearACCXVIII (✉)	93	\LinearACLXXXIX (✉)	94
\LinearACCLXVIII (✉)	94	\LinearACCX (✉)	93	\LinearACLXXXII (✉)	94
\LinearACCLXX (✉)	94	\LinearACCXI (✉)	93	\LinearACLXXXIII (✉)	94
\LinearACCLXI (✉)	94	\LinearACCXII (✉)	93	\LinearACLXXXIV (✉)	94
\LinearACCLXXII (✉)	94	\LinearACCXIII (✉)	93	\LinearACLXXXIX (✉)	94
\LinearACCLXXIII (✉)	94	\LinearACCXIV (✉)	93	\LinearACLXXXV (✉)	94
\LinearACCLXXIV (✉)	94	\LinearACCXV (✉)	93	\LinearACLXXXVI (✉)	94
\LinearACCLXXIX (✉)	94	\LinearACCXVII (✉)	93	\LinearACLXXXVII (✉)	94
\LinearACCLXXV (✉)	94	\LinearACCXVIII (✉)	93	\LinearACLXXXVIII (✉)	94
\LinearACCLXXVI (✉)	94	\LinearACCXVI (✉)	93	\LinearACLXXXIX (✉)	94
\LinearACCLXXVII (✉)	94	\LinearACCXXVII (✉)	93	\LinearACLXXXX (✉)	94
\LinearACCLXXVIII (✉)	94	\LinearACCXXVIII (✉)	93	\LinearACV (✉)	92
\LinearACCLXXIX (✉)	94	\LinearACCXXXI (✉)	93	\LinearACVI (✉)	92
\LinearACCLXXX (✉)	94	\LinearACCXXXII (✉)	93	\LinearACVII (✉)	92
\LinearACCLXXXI (✉)	94	\LinearACCXXXIII (✉)	93	\LinearACVIII (✉)	93
\LinearACCLXXXII (✉)	94	\LinearACCXXXIV (✉)	93	\LinearACX (✉)	93
\LinearACCLXXXIII (✉)	94	\LinearACCXXXIX (✉)	93	\LinearACXCI (✉)	94
\LinearACCLXXXIV (✉)	94	\LinearACCXXXIX (✉)	93	\LinearACXII (✉)	94
\LinearACCLXXXV (✉)	94	\LinearACCXXXV (✉)	93	\LinearACXCIV (✉)	94
\LinearACCLXXXVI (✉)	94	\LinearACCXXXVI (✉)	93	\LinearACXIX (✉)	92
\LinearACCLXXXVII (✉)	94	\LinearACCXXXVII (✉)	93	\LinearACXCV (✉)	94



\l11 (««)	45
\l1less	see \l11
\l1less (««)	45
\l1parenthesis (()	60
\lmoustache (ʃ)	61
\lmoustache (ʃ)	62
\ln (ln)	56
\lnapprox (≈)	44
\lnapprox (≤)	43
\lnapprox (≥)	45
\lneq (≤)	44
\lneq (≤)	43
\lneqq (≤)	44
\lneqq (≤)	43
\lneqq (≤)	45
\lnot	see \neg
\lnot (¬)	74
\lnsim (≈)	44
\lnsim (≤)	43
\lnsim (≥)	45
local ring (օ)	see alphabets, math
\log (log)	56, 123
log-like symbols	56, 123
logic gates	81
logical operators	
and	see \wedge
not	see \neg and \sim
or	see \vee
\logof (⊗)	35
lollipop	see \multimap
long division	66
\longa (—)	106
\longcasting (O-O-O)	104
longdiv (package)	66
\Longleftarrow (←=)	47
\Longleftarrow (←=)	50
\Longleftarrow (←)	50
\Longleftarrow (←)	47
\Longleftrightarrow (↔=)	47
\Longleftrightarrow (↔=)	50
\Longleftrightarrow (↔)	50
\longleftrightarrow (←→)	47
\Longmapsfrom (←=)	48
\longmapsfrom (←=)	48
\Longmapsto (→=)	48
\longmapsto (→=)	50
\longmapsto (→=)	47
\LongPulseHigh (⌞⌞)	78
\LongPulseLow (⌞⌞)	78
\Longrightarrow (→=)	47
\Longrightarrow (→=)	50
\longrightarrow (→)	50
\longrightarrow (→)	47
\looparrowdownleft (↶)	49
\looparrowdownright (↷)	49
\looparrowleft (↶)	49
\looparrowleft (↶)	48
\looparrowleft (↶)	50
\looparrowright (↷)	49
\looparrowright (↷)	48
\looparrowright (↷)	50
\Loosebearing (△)	82
\lor	see \vee
\LowerDiamond (◆)	89
lowering	see \textlowering
\lozenge (◊)	73
\lozenge (◊)	88
\Lparen (()	76
\lrcorner („)	60
\lrcorner („)	60
\lrcorner („)	62
\lrcorner („)	62
\lrJoin	see \Join
\lrtimes (⊗)	35
\lsem (  )	62
\lsemantic	see \ldbrack
\Lsh (↶)	49
\Lsh (↑)	48
\Lsh (↑)	50
\Lsteel (L)	82
\ltimes (⊗)	26
\ltimes (⊗)	24
\ltimes (⊗)	26
\ltriple	64
Luecking, Dan	116
\lVert (  )	61
\lVert (  )	64
\lvert ( )	61
\lvertneqq (⊏)	44
\lvertneqq (⊏)	43
\lvertneqq (⊏)	45
\lwave (⤵)	63
\lWavy (⤵)	62
\lwavey (⤵)	62
\lz (ȝ)	14
M	
\M	11
\M (‘)	105
\m	11
\m (—)	105
\ma (ꝝ)	105
\macron (ꝝ)	18
macron (ꝝ)	see accents
\Maggie (ℳ)	106
magical signs	107
majuscules	57
\makeatletter	117
\makeatother	117
\MALE (♂)	82
\Male (♂)	82
male	79, 82
\male (♂)	82
\MaleMale (⚥)	82
\maltese (✠)	11
\maltese (✠)	74
man	91, 101
\manboldkidney (⌚)	100
\manconcentriccircles (◎)	100
\manconcentricdiamond (❖)	100
\mancone (▷)	100
\mancube (▣)	100
\manerrarrow (⤷)	100
\manfilledquartercircle (▣)	100
manfnt (package)	99, 100, 130
\manhpennib (▬)	100
\animpossiblecube (▣)	100
\mankidney (⌚)	100
\manlhpennib (▬)	100
\manpenkidney (⌚)	100
\manquadrifolium (❖)	100
\manquartercircle (↷)	100
\manrotatedquadrifolium (❖)	100
\manrotatedquartercircle (↷)	100
\manstar (☆)	100
\mantiltppennib (▬)	100
\mantriangledown (▼)	100
\mantriangleright (▶)	100
\mantriangleup (▲)	100
\manvpennib (▬)	100
\Mappedfromchar (⌚)	55
\mappedfromchar (⌚)	55
\Mapsfrom (⇐)	48
\mapsfrom (↔)	48
\Mapsfromchar (⌚)	56
\Mapsfromchar (⌚)	55
\Mapsfromchar (⌚)	56
\mapsfromchar (⌚)	55
\mapsfromchar (⌚)	55
\Mapsto (⇒)	48
\mapsto (→)	47
\mapsto (→)	51
\Mapstochar (⌚)	56
\Mapstochar (⌚)	55
\mapstochar (⌚)	56
	
\Marge (ℳ)	106
\markera (✗)	104
\markerb (>O)	104
married	see \textmarried
\Mars (♂)	79
\Mars (♂)	79
\mars (♂)	79
\MartinVogel (ℳ)	101

marvosym (package)	20, 72, 74, 79, 80, 82, 84, 100, 101, 111
masonic cipher	108
\mate (#)	104
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 \rightarrow and \nsupset
math alphabets	76
mathabx (package)	23, 26, 28, 30, 34, 36, 41, 42, 44, 46, 49, 56, 59–62, 65, 67, 72, 73, 79, 103, 110, 111, 130, 131, 134
\mathaccent	114
\mathbb	76
\mathbbm	76
\mathbbmss	76
\mathbbmtt	76
mathbbol (package)	76
\mathbf	124
\mathbin	123
\mathbold	124
mathcal (euscript package option)	76
\mathcal	76
\mathcent (¢)	59
\mathchoice	116
\mathclose	123
mathcomp (package)	72
mathdesign (package)	20, 27, 33, 60, 63, 75, 130
\mathdollar (\$)	23
mathdots (package)	65, 70, 71, 117, 130, 131
\mathds	76
\mathellipsis (...)	23
mathematical symbols	23–77
\mathfrak	76
\mathit	76
\mathnormal	76
\mathop	123
\mathopen	123
\mathord	123
\mathpalette	116, 117
\mathparagraph (¶)	23
\mathpunct	123
\mathpzc	76
\mathrel	113, 123
\mathring (°)	65, 66
\mathrm	76
mathrsfs (package)	76, 130
mathscr (euscript package option)	76
\mathscr	76
\mathsection (§)	23
\mathsterling (£)	59
\mathsterling (£)	23
mathtools (package)	23, 39, 67, 69, 130, 131
\mathunderscore (_)	23
\max (max)	56
Maxwell-Stefan diffusion coefficient	see \DH
\maya	72
\Mb (ڏ)	105
\mb (ڻ)	105
\Mbb (ڦ)	105
mbboard (package)	76, 130
\mbbx (ڦ)	105
\mbox	116, 117
\measuredangle (፳)	73
\measuredangle (፲)	73
\measuredangle (፴)	74
mechanical scaling	120, 122
\medbackslash (\\)	26, 27
\medbullet (●)	25
\medcirc (○)	25
\medcircle (○)	26
\meddiamond (◇)	28
\medlozenge (◇)	88
\medslash (\\)	26
\medsquare (□)	28
\medstar (☆)	28
\medstarofdavid (✡)	88
\medtriangledown (▽)	28, 47
\medtriangleleft (◁)	28, 47
\medtriangleright (▷)	28, 47
\medtriangleup (△)	28, 47
\medvert (፤)	26, 27
\medvertdot (፤)	26
membership	see \in
\Mercury (☿)	79
\Mercury (♀)	79
\mercury (☿)	79
\merge (ℳ)	25
METAFONT	77, 119–123
METAFONTbook symbols	100
metre (package)	18, 65, 105, 130, 131
metre	105
metrical symbols	105, 106
\mho (℧)	73
micro	see \textmu
\micro (μ)	78
Microsoft® Windows®	126
\mid ( )	34, 63
\middle	61
\midtilde (~)	20
MIL-STD-806	81
millesimal sign	see \textperthousand
milstd (package)	81, 130
\min (min)	56, 123
minim	see musical symbols
minus	see \textminus
\minus (-)	26
\minuscolon (-:)	41
\minuscoloncolon (-::)	41
\minusdot (-)	27
\minushookdown (‐)	74
\minushookup (‐)	74
\minuso (⊖)	25, 115
minutes, angular	see \prime
miscellaneous symbols	73–75, 90, 98–109
“Missing \$ inserted”	23
\Mmappedfromchar (Ⓜ)	55
\mmappedfromchar (Ⓜ)	55
\Mmapstochar (Ⓜ)	55
\mmapstochar (Ⓜ)	55
MnSymbol (package)	23, 26–28, 32, 33, 36–38, 42, 45, 47, 50–55, 58, 59, 62, 65–67, 71, 74, 88, 130, 131
\Mobilefone (-Mobile)	82
\mod	56
\models (\models)	34, 113
\models (\models)	37
moduli space	see alphabets, math
monetary symbols	20, 21, 76
monus	see \dotdiv
\moo (±)	25
\Moon (☽)	79
\Moon (☾)	79
\MoonPha	108
\morepawns (>)	104
\moreroom (○)	104
\Mountain (▲)	102
mouse	see \ComputerMouse
\MoveDown (▼)	100
\overlay	117
\MoveUp (▲)	100
\mp (∓)	24
\mp (∓)	27
\mu (μ)	57
\multimap (→)	34, 35
\multimap (→)	54
\multimapboth (○→)	35
\multimapbothvert (○)	35
\multimapdot (→)	35
\multimapdotboth (●→)	35
\multimapdotbothA (○→)	35
\multimapdotbothAvert (○)	35
\multimapdotbothB (●→)	35

\multimapdotbothBvert (⌚)	35
\multimapdotbothvert (⌚)	35
\multimapdotinv (●—)	35
\multimapinv (○—)	35
multiple accents per character	118
multiplicative disjunction	..... see \bindnasrepma, \invamp, and \parr
\Mundus (⌚)	101
Museum of Icelandic Sorcery and Witchcraft	108
musical symbols	22, 73, 74, 98, 99
musixtex (package)	99
\muup ( $\mu$ )	57
\MVAat (@)	101
\MVEight (8)	72
\MVFive (5)	72
\MVFour (4)	72
\MVNine (9)	72
\MVOne (1)	72
\MVRrightarrow ( $\rightarrow$ )	101
\MVSeven (7)	72
\MVSix (6)	72
\MVThree (3)	72
\MVTtwo (2)	72
\MVZero (0)	72
<b>N</b>	
\nabla ( $\nabla$ )	73
\nabla ( $\nabla$ )	74
\NAK (\$)	81
NAND gates	81
	
\NANDd (⌚)	81
	
\NANDl (⌚)	81
	
\NANDr (⌚)	81
	
\NANDu (⌚)	81
\napprox ( $\approx$ )	36
\napprox ( $\approx$ )	38
\napproxeq ( $\approx$ )	35
\napproxeq ( $\approx$ )	38
\nasymptop ( $\approx$ )	35
\nasymptop ( $\approx$ )	55
nath (package)	60, 64, 130
\NATURAL (ℕ)	56
\Natural (ℕ)	56
\natural (⌚)	73, 98
\natural (⌚)	74
natural numbers (ℕ)	see alphabets, math
navigation symbols	100
\backapprox ( $\approx$ )	38
\backapproxeq ( $\approx$ )	38
\backcong ( $\not\approx$ )	38
\backeqsim ( $\not\approx$ )	38
\backsim ( $\not\approx$ )	35
\backsimeq ( $\not\approx$ )	38
\backtriplesim ( $\not\approx$ )	38
\NBSP ( $\text{~}$ )	81
\Bumpeq ( $\not\approx$ )	35
\Bumpeq ( $\not\approx$ )	38
\bumpeq ( $\not\approx$ )	35
\bumpeq ( $\not\approx$ )	38
\circeq ( $\not\approx$ )	38
\circlearrowleft ( $\circlearrowleft$ )	53
\circlearrowright ( $\circlearrowright$ )	53
\closedeq ( $\not\approx$ )	38
\cong ( $\not\approx$ )	36
\cong ( $\not\approx$ )	34
\cong ( $\not\approx$ )	38
\curlyeqprec ( $\not\approx$ )	36
\curlyeqprec ( $\not\approx$ )	38
\curlyeqsucc ( $\not\approx$ )	36
\curlyeqsucc ( $\not\approx$ )	38
\curvearrowdownup ( $\curvearrowdownup$ )	51
\curvearrowleft ( $\curvearrowleft$ )	53
\curvearrowleftright ( $\curvearrowleftright$ )	51
\curvearrownesw ( $\curvearrownesw$ )	51
\curvearrownwse ( $\curvearrownwse$ )	51
\curvearrowright ( $\curvearrowright$ )	53
\curvearrowrightleft ( $\curvearrowrightleft$ )	51
\curvearrowsenw ( $\curvearrowsenw$ )	51
\curvearrowswne ( $\curvearrowswne$ )	51
\curvearrowupdown ( $\curvearrowupdown$ )	51
\dasharrow ( $\dasharrow$ )	53
\dasheddownarrow ( $\dasheddownarrow$ )	51
\dashedleftarrow ( $\dashedleftarrow$ )	51
\dashednearrow ( $\dashednearrow$ )	51
\dashednarrow ( $\dashednarrow$ )	51
\dashedrightarrow ( $\dashedrightarrow$ )	51
\dashedsearrow ( $\dashedsearrow$ )	51
\dashedswarrow ( $\dashedswarrow$ )	52
\dasheduparrow ( $\dasheduparrow$ )	52
\dashleftarrow ( $\dashleftarrow$ )	53
\dashrightarrow ( $\dashrightarrow$ )	53
\DashV ( $\dashv$ )	36
\dashv ( $\dashv$ )	38
\dashVv ( $\dashv$ )	36
\ddtstile ( $\ddtstile$ )	40
\dststile ( $\dststile$ )	40
\dttstile ( $\dttstile$ )	40
\ne	..... see \neg
\ne ( $\neq$ )	38
\nearrow ( $\nearrow$ )	49
\nearrow ( $\nearrow$ )	50
\nearrow ( $\nearrow$ )	49
\nearrow ( $\nearrow$ )	47, 117
\nearrow ( $\nearrow$ )	50
\nearrowtail ( $\nearrowtail$ )	50
\nefilledspoon ( $\nefilledspoon$ )	54
\nefootline ( $\nefootline$ )	37
\nefree ( $\nefree$ )	37
\neg ( $\neg$ )	73
\neg ( $\neg$ )	74
negation	..... see \neg and \sim
\neharpoonccw ( $\neharpoonccw$ )	53
\neharpooncw ( $\neharpooncw$ )	53
\nelsquigarrow ( $\nelsquigarrow$ )	50
\nmapsto ( $\nmapsto$ )	50
\nModels ( $\nmodels$ )	37
\nmodels ( $\nmodels$ )	37
\nenearrows ( $\nenearrows$ )	50
\nepitchfork ( $\nepitchfork$ )	54
\Neptune ( $\Psi$ )	79
\Neptune ( $\Psi$ )	79
\neptune ( $\ne$ )	79
\neq ( $\neq$ )	36
\neq ( $\neq$ )	42
\neq ( $\neq$ )	38
\neqbump ( $\neqbump$ )	38
\neqcirc ( $\neqcirc$ )	38
\neqdot ( $\neqdot$ )	38
\neqfrown ( $\neqfrown$ )	55

\neqsim (#)	38	\ngtr (†)	44	\nLeftarrow (↔)	48
\neqslantgtr (#)	44	\ngtr (↗)	43	\nLeftarrow (⤏)	52
\neqslantgtr (↘)	45	\ngtr (↙)	45	\nleftarrow (⤏)	49
\neqslantless (⩲)	44	\ngtrapprox (⩳)	44	\nleftarrow (⤏)	48
\neqslantless (⩳)	45	\ngtrapprox (⩴)	43	\nleftarrow (⤏)	52
\neqsmile (#)	55	\ngtrclosed (⩵)	45, 47	\nleftarrowtail (⤏)	52
\nequal (#)	38	\ngtrdot (⩶)	45	\nleftfilledspoon (⤏)	54
\nequalclosed (#)	38	\ngtreqless (⩷)	45	\nleftfootline (⤏)	38
\nequiv (#)	35	\ngtreqlesslant (⩸)	45	\nleftfree (⤏)	38
\nequiv (#)	38	\ngtreqqless (⩹)	45	\nleftharpoonccw (⤏)	53
\nequivclosed (#)	38	\ngtrless (⩺)	43	\nleftharpooncw (⤏)	53
\nersquigarrow (⤊)	50	\ngtrless (⩺)	45	\nleftleftarrows (⤏)	52
\nespoon (⤋)	54	\ngtrless (⩺)	45	\nleftlsquigarrow (⤏)	52
\Neswarrow (⤌)	50	\ngtrsim (⩻)	44	\nleftmapsto (⤏)	52
\neswarrow (⤍)	117	\ngtrsim (⩻)	43	\nleftModels (⤏)	38
\neswarrow (⤎)	50	\nhateq (#)	38	\nleftmodels (⤏)	38
\neswarrows (⤏)	50	\nhookleftarrow (⤏)	53	\nleftpitchfork (⤏)	54
\neswbiproto (⤐)	27	\nhookrightarrow (⤏)	53	\nLeftrightarrow (⤏)	49
\neswcrossing (⤏)	38	\ni (⠃)	59, 115	\nLeftrightarrow (⤏)	48
\neswharpoonnwse (⤏)	53	\ni (⠃)	59	\nLeftrightarrow (⤏)	52
\neswharpoons (⤏)	53	\nialpha (⠄)	14	\nLeftrightarrow (⤏)	49
\neswharpoonsenw (⤏)	53	\nibar . . . . .	see \ownsbar	\nLeftrightarrow (⤏)	23, 48
\Neswline (⤏)	37	\nibeta (⠄)	14	\nLeftrightarrow (⤏)	52
\neswline (⤏)	37	\NibLeft (⤊)	85	\nLeftrightarrows (⤏)	52
\Neutral (⠄)	82	\NibRight (⤊)	85	\nleftrightharpoondownup (⤏)	53
\nevDash (⤏)	37	nibs . . . . .	85	\nleftrightharpoons (⤏)	53
\nevDash (⤏)	37	\NibSolidLeft (⤊)	85	\nleftrightharpoonupdown (⤏)	53
\newextarrow . . . . .	70	\NibSolidRight (⤊)	85	\nLeftrightline (⤏)	38
\newmetrics . . . . .	106	nicefrac (package) . . . . .	74, 130, 132	\nleftrightline (⤏)	38
\newmoon (⠄)	79	\nichi (⠄)	14	\nleftrightsquigarrow (⤏)	53
\newmoon (⠄)	79	\niepsilon (⠄)	14	\nleftrtsquigarrow (⤏)	52
\newtie (⠄)	16	\nigamma (⠄)	14	\nleftspoon (⤏)	54
\nexists (#)	59	\niota (⠄)	14	\nleftVdash (⠄)	38
\nexists (#)	59	\nilambda (⠄)	14	\nleftvdash (⠄)	38
\nexists (#)	59	\nin (⠄)	59	\nleq (⠄)	44
\nfallingdotseq (#)	38	\niomega (⠄)	14	\nleq (⠄)	43, 44
\nfrown (⤏)	55	\niphil (⠄)	14	\nleq (⠄)	45
\nfrownneq (#)	55	\niplus (⠄)	34	\nleqclosed (⠄)	45, 47
\nfrownneqsmile (#)	55	\nisigma (⠄)	14	\nleqdot (⠄)	45
\nfrownsmile (⠄)	55	\nitheta (⠄)	14	\nleqq (⠄)	44
\nfrownsmileeq (⠄)	55	\niupsilon (⠄)	14	\nleqq (⠄)	43
\NG (⠄)	11	\niv (⠄)	60	\nleqq (⠄)	45
\ng (⠄)	11	\nj (⠄)	14	\nleqslant (⠄)	43
\ngeq (#)	44	\nlccleararrowdown (⠄)	52	\nleqslant (⠄)	45
\ngeq (⠄)	43, 44	\nlccleararrowleft (⠄)	52	\nleqslantdot (⠄)	45
\ngeq (#)	45	\nlccleararrowright (⠄)	52	\nless (⠄)	44
\ngeqclosed (⠄)	45, 47	\nlcurvearrowdown (⠄)	52	\nless (⠄)	43
\ngeqdot (⠄)	45	\nlcurvearrowleft (⠄)	52	\nless (⠄)	45
\ngeqq (⠄)	44	\nlcurvearrowone (⠄)	52	\nlessapprox (⠄)	44
\ngeqq (⠄)	43	\nlcurvearrowownw (⠄)	52	\nlessapprox (⠄)	43
\ngeqq (⠄)	45	\nlcurvearrowright (⠄)	52	\nlessclosed (⠄)	45, 47
\ngeqlantdot (⠄)	45	\nlcurvearrowse (⠄)	52	\nlessdot (⠄)	45
\ngets (⤏)	53	\nlcurvearrowsw (⠄)	52	\nlesseqtrslant (⠄)	45
\ngg (⠄)	43	\nlcurvearrowup (⠄)	52	\nlesseqgtr (⠄)	45
\ngg (⠄)	45	\nleadsto (⠄)	53	\nlesseqgtrslant (⠄)	45
\nggg (⠄)	45	\nLeftarrow (⤏)	49		

\nlessgtr (\$)	43
\nlessgtr (\$)	45
\nlesssim (\$)	44
\nlesssim (\$)	43
\nlhookdownarrow (↓)	52
\nlhookleftarrow (↔)	52
\nlhooknearrow (↗)	52
\nlhooknwarrow (↖)	51
\nlhookrightarrow (↔)	51
\nlhooksearrow (↘)	51
\nlhookswarrow (↙)	51
\nlhookuparrow (↑)	51
\nlll (⋘)	43
\nlll (⋙)	45
\nLleftarrow (⟲)	51
\nlll (⋘)	45
\nmapsto (→)	53
\nmid (†)	34
\nmid (†)	38
\nmodels (#)	38
\nmultimap (⤠)	54
\ndtstile (  )	40
\narrow (↗)	51
\nearrow (↗)	48
\nearrow (↗)	51
\nearrowtail (↗)	51
\nefilledspoon (↗)	54
\nefootline (↗)	38
\nefree (↗)	38
\neharpoonccw (↗)	53
\neharpooncw (↗)	53
\nellsquigarrow (↗)	51
\nemapsto (↗)	51
\nemModels (⤠)	38
\nemmodels (⤠)	38
\nenarrows (⤠)	51
\nepitchfork (⤠)	54
\nersquigarrow (↗)	51
\nespoon (↗)	54
\nesarrow (⤠)	51
\nesarrow (⤠)	52
\nesarrows (⤠)	52
\nesharpoonnw (↗)	53
\nesharpoons (⤠)	53
\nesharpoonsenw (↗)	53
\neswline (⤠)	38
\neswline (↗)	38
\neVdash (⤠)	38
\nevDash (⤠)	38
\nststile (  )	40
\ntstile (  )	39
\nttstile (  )	39
\Narrow (⤠)	52
\narrow (↗)	48
\narrow (↖)	52
\narrowtail (⤠)	52
\nnfilledspoon (↗)	54
\nnfootline (⤠)	38
\nnfree (⤠)	38
\nharpoonccw (⤠)	53
\nharpooncw (⤠)	53
\nlsquigarrow (⤠)	52
\nmapsto (⤠)	52
\nModels (⤠)	38
\nmodels (⤠)	38
\nnarrows (⤠)	52
\npitchfork (⤠)	54
\nrsquigarrow (⤠)	52
\nsearrow (⤠)	52
\nsearrows (⤠)	52
\nseharpoonnesw (⤠)	53
\nseharpoons (⤠)	53
\nseharpoonswne (⤠)	53
\nwseline (⤠)	38
\nwseline (⤠)	38
\nspoon (⤠)	54
\nVdash (⤠)	38
\nvdash (⤠)	38
no entry	see \noway
\NoBleech (⤠)	100
\NoChemicalCleaning (⤠)	100
nintegrals (wasysym package option)	29
\NoIroning (⤠)	100
non-commutative division	70
nonbreaking space	81
NOR gates	81
\NORd (⤠)	81
\NOR1 (⤠)	81
norm	see \lVert and \rVert
\NORr (⤠)	81
\NORu (⤠)	81
\NoSun (⤠)	101
not	see \neg
\not	36, 115
not equal (≠ vs. †)	36
\notasymp (⤠)	36
\notbackslash (⤠)	80
\notbot (⤠)	59
\notdivides (⤠)	36
\notequiv (⤠)	36
\notinin (⤠)	59
\notinin (⤠)	59
\notinin (⤠)	60
\notinin (⤠)	59
\notni (⤠)	59
\notowner (⤠)	59
\notowns ... see \notowner and \notni	
\notperp (⤠)	36
\notslash (⤠)	80
\notsmallin (⤠)	60
\notsmallowns (⤠)	60
\nottop (⤠)	59
\NoTumbler (⤠)	100
\novelty (N)	104
\noway (⤠)	101
\nowns (⤠)	59
\parallel (⤠)	34
\parallel (⤠)	38
\parallelslant (⤠)	41
\nperp (⤠)	38
\pitchfork (⤠)	54
\nplus (⤠)	25
\nprec (⤠)	36
\nprec (⤠)	34
\nprec (⤠)	38
\nprecapprox (⤠)	36
\nprecapprox (⤠)	35
\nprecapprox (⤠)	38
\npreccurlyeq (⤠)	36
\npreccurlyeq (⤠)	35
\npreccurlyeq (⤠)	38
\npreceq (⤠)	36
\npreceq (⤠)	34
\npreceq (⤠)	38
\npreceqq (⤠)	35
\nrecsim (⤠)	36
\nrecsim (⤠)	35
\nrecsim (⤠)	38
\ncirclearrowdown (⤠)	52
\ncirclearrowleft (⤠)	52
\ncirclearrowright (⤠)	52
\ncirclearrowup (⤠)	52
\ncurvearrowdown (⤠)	52
\curvearrowleft (⤠)	52
\curvearrowone (⤠)	52
\curvearrownw (⤠)	52
\curvearrowright (⤠)	52
\curvearrowse (⤠)	52
\curvearrowsw (⤠)	52
\curvearrowup (⤠)	52
\Relbar (⤠)	38
\relbar (⤠)	38
\restriction (⤠)	53
\hookdownarrow (⤠)	52
\hookleftarrow (⤠)	52
\hookrightarrow (⤠)	52
\hooknearrow (⤠)	52
\hooknwarrow (⤠)	52
\hookrightarrow (⤠)	52
\hookuparrow (⤠)	52
\Rightarrow (⤠)	49
\rightarrow (⤠)	48

\nRightarrow ( $\Rightarrow$ ) . . . . .	52	\nsmileeqfrown ( $\not\equiv$ ) . . . . .	55	\nsubseteqq ( $\subseteq$ ) . . . . .	42
\nrightarrow ( $\rightarrow$ ) . . . . .	49	\nsmilefrown ( $\not\equiv$ ) . . . . .	55	\nsubseteqq ( $\not\subseteq$ ) . . . . .	41
\nrightarrow ( $\rightarrow$ ) . . . . .	48	\nsmilefrowneq ( $\not\equiv$ ) . . . . .	55	\nsubseteqq ( $\not\subset$ ) . . . . .	42
\nrightarrow ( $\rightarrow$ ) . . . . .	52	\nsqdoublefrown ( $\not\approx$ ) . . . . .	55	\nsucc ( $\succ$ ) . . . . .	36
\nrightarrowtail ( $\rightarrowtail$ ) . . . . .	52	\nsqdoublefrowneq ( $\not\approx$ ) . . . . .	55	\nsucc ( $\succ$ ) . . . . .	34
\nrightfilledspoon ( $\rightsquigarrow$ ) . . . . .	54	\nsqdoublesmile ( $\not\approx$ ) . . . . .	55	\nsucc ( $\succ$ ) . . . . .	38
\nrightfootline ( $\rightarrow$ ) . . . . .	38	\nsqdoublesmileq ( $\not\approx$ ) . . . . .	55	\nsuccapprox ( $\not\approx$ ) . . . . .	36
\nrightfree ( $\rightarrow$ ) . . . . .	38	\nsqeqfrown ( $\not\approx$ ) . . . . .	55	\nsuccapprox ( $\not\approx$ ) . . . . .	35
\nightharpoonccw ( $\rightarrow$ ) . . . . .	53	\nsqeqsmile ( $\not\approx$ ) . . . . .	55	\nsuccapprox ( $\not\approx$ ) . . . . .	38
\nightharpooncw ( $\rightarrow$ ) . . . . .	53	\nsqfrown ( $\not\approx$ ) . . . . .	55	\nsucccurlyeq ( $\not\approx$ ) . . . . .	36
\nrightleftarrows ( $\not\approx$ ) . . . . .	51	\nsqfrowneq ( $\not\approx$ ) . . . . .	55	\nsucccurlyeq ( $\not\approx$ ) . . . . .	35
\nrightleftharpoons ( $\not\approx$ ) . . . . .	53	\nsqfrowneqsmile ( $\not\approx$ ) . . . . .	55	\nsucccurlyeq ( $\not\approx$ ) . . . . .	38
\nrightlsquigarrow ( $\rightarrowtail$ ) . . . . .	51	\nsqfrownsmile ( $\not\approx$ ) . . . . .	55	\nsucceq ( $\succeq$ ) . . . . .	36
\nrightmapsto ( $\rightarrow$ ) . . . . .	51	\nsqsmile ( $\not\approx$ ) . . . . .	55	\nsucceq ( $\not\succeq$ ) . . . . .	34
\nrightModels ( $\not\approx$ ) . . . . .	38	\nsqsmileeq ( $\not\approx$ ) . . . . .	55	\nsucceq ( $\not\succeq$ ) . . . . .	38
\nrightmodels ( $\not\approx$ ) . . . . .	38	\nsqsmileeqfrown ( $\not\approx$ ) . . . . .	55	\nsucceqq ( $\not\succeq$ ) . . . . .	35
\nrightpitchfork ( $\not\approx$ ) . . . . .	54	\nsqsmilefrown ( $\not\approx$ ) . . . . .	55	\nsuccsim ( $\not\sim$ ) . . . . .	36
\nrightrightarrows ( $\not\approx$ ) . . . . .	51	\nSqsubset ( $\not\subseteq$ ) . . . . .	42	\nsuccsim ( $\not\sim$ ) . . . . .	35
\nrightrsquigarrow ( $\rightarrowtail$ ) . . . . .	51	\nSqSubset ( $\not\subseteq$ ) . . . . .	42	\nsuccsim ( $\not\sim$ ) . . . . .	38
\nrightspoon ( $\rightsquigarrow$ ) . . . . .	54	\nSqsubset ( $\not\subset$ ) . . . . .	42	\nSupset ( $\not\supset$ ) . . . . .	42
\nightsquigarrow ( $\rightsquigarrow$ ) . . . . .	53	\nSqsubset ( $\not\subseteq$ ) . . . . .	41	\nSupset ( $\not\supset$ ) . . . . .	41
\nrightVdash ( $\not\Vdash$ ) . . . . .	38	\nSqsubset ( $\not\subset$ ) . . . . .	42	\nSupset ( $\not\supset$ ) . . . . .	42
\nrightvdash ( $\not\Vdash$ ) . . . . .	38	\nSqsubseteq ( $\not\subseteq$ ) . . . . .	42	\nSupset ( $\not\supset$ ) . . . . .	42
\nrisingdotseq ( $\not\approx$ ) . . . . .	38	\nSqsubseteq ( $\not\subset$ ) . . . . .	41	\nSupset ( $\not\supset$ ) . . . . .	42
\nRrightarrow ( $\not\Rightarrow$ ) . . . . .	51	\nSqsubseteqq ( $\not\subseteq$ ) . . . . .	42	\nSupseteq ( $\not\supseteq$ ) . . . . .	42
\nsdtstile ( $\not\models$ ) . . . . .	39	\nSqsubseteqq ( $\not\subset$ ) . . . . .	42	\nSupseteqq ( $\not\supseteq$ ) . . . . .	41
\nSearrow ( $\not\rightarrow$ ) . . . . .	51	\nSqsupset ( $\not\supset$ ) . . . . .	42	\nSupseteqq ( $\not\supseteq$ ) . . . . .	42
\nsearrow ( $\not\rightarrow$ ) . . . . .	51	\nSqSupset ( $\not\supset$ ) . . . . .	42	\nSupseteqq ( $\not\supseteq$ ) . . . . .	42
\nsearrowtail ( $\not\rightarrow$ ) . . . . .	51	\nSqsupset ( $\not\supset$ ) . . . . .	42	\nSupseteqq ( $\not\supseteq$ ) . . . . .	42
\nsefilledspoon ( $\not\rightarrow$ ) . . . . .	54	\nSqsupset ( $\not\supset$ ) . . . . .	41	\nSwallow ( $\not\rightarrow$ ) . . . . .	52
\nsefootline ( $\not\rightarrow$ ) . . . . .	38	\nSqsupset ( $\not\supset$ ) . . . . .	42	\nswarrow ( $\not\rightarrow$ ) . . . . .	52
\nsefree ( $\not\rightarrow$ ) . . . . .	38	\nSqsupseteq ( $\not\supseteq$ ) . . . . .	42	\nswarrowtail ( $\not\rightarrow$ ) . . . . .	52
\nseharpoonccw ( $\not\rightarrow$ ) . . . . .	53	\nSqsupseteq ( $\not\supseteq$ ) . . . . .	41	\nswfilledspoon ( $\not\rightarrow$ ) . . . . .	54
\nseharpooncw ( $\not\rightarrow$ ) . . . . .	53	\nSqsupseteqq ( $\not\supseteq$ ) . . . . .	42	\nswfootline ( $\not\rightarrow$ ) . . . . .	38
\nselsquigarrow ( $\not\rightarrow$ ) . . . . .	51	\nSqsupseteqq ( $\not\supseteq$ ) . . . . .	42	\nswfree ( $\not\rightarrow$ ) . . . . .	38
\nsemapsto ( $\not\rightarrow$ ) . . . . .	51	\nSqsupseteqq ( $\not\supseteq$ ) . . . . .	42	\nsharpoonccw ( $\not\rightarrow$ ) . . . . .	53
\nseModels ( $\not\approx$ ) . . . . .	38	\nSqtriplefrown ( $\not\approx$ ) . . . . .	55	\nsharpooncw ( $\not\rightarrow$ ) . . . . .	53
\nsemodels ( $\not\approx$ ) . . . . .	38	\nSqtriplesmile ( $\not\approx$ ) . . . . .	55	\nswlsquigarrow ( $\not\rightarrow$ ) . . . . .	52
\nsenarrows ( $\not\rightarrow$ ) . . . . .	51	\nSquigarrowdownup ( $\not\rightarrow$ ) . . . . .	52	\nswmapsto ( $\not\rightarrow$ ) . . . . .	52
\nsenwharpoons ( $\not\rightarrow$ ) . . . . .	53	\nSquigarrowleftright ( $\not\leftrightarrow$ ) . . . . .	52	\nswModels ( $\not\approx$ ) . . . . .	38
\nsepitchfork ( $\not\rightarrow$ ) . . . . .	54	\nSquigarrownesw ( $\not\leftrightarrow$ ) . . . . .	52	\nswmodels ( $\not\approx$ ) . . . . .	38
\nsersquigarrow ( $\not\rightarrow$ ) . . . . .	51	\nSquigarrownwse ( $\not\rightarrow$ ) . . . . .	52	\nswnearrows ( $\not\rightarrow$ ) . . . . .	52
\nsesearrows ( $\not\rightarrow$ ) . . . . .	51	\nSquigarrowrightleft ( $\not\rightarrow$ ) . . . . .	52	\nswneharpoons ( $\not\rightarrow$ ) . . . . .	53
\nsespoon ( $\not\rightarrow$ ) . . . . .	54	\nSquigarrowsenw ( $\not\rightarrow$ ) . . . . .	52	\nswpitchfork ( $\not\rightarrow$ ) . . . . .	54
\nseVdash ( $\not\Vdash$ ) . . . . .	38	\nSquigarrowswne ( $\not\rightarrow$ ) . . . . .	52	\nswrsquigarrow ( $\not\rightarrow$ ) . . . . .	52
\nsevdash ( $\not\Vdash$ ) . . . . .	38	\nSquigarrowupdown ( $\not\rightarrow$ ) . . . . .	52	\nswspoon ( $\not\rightarrow$ ) . . . . .	54
\nshortmid ( $\not\mid$ ) . . . . .	34	\nSststile ( $\not\models$ ) . . . . .	39	\nswswarrows ( $\not\rightarrow$ ) . . . . .	52
\nshortmid ( $\not\mid$ ) . . . . .	38	\nStstile ( $\not\models$ ) . . . . .	39	\nswVdash ( $\not\Vdash$ ) . . . . .	38
\nshortparallel ( $\not\parallel$ ) . . . . .	34	\nSttstile ( $\not\models$ ) . . . . .	39	\nswvDash ( $\not\Vdash$ ) . . . . .	38
\nshortparallel ( $\not\parallel$ ) . . . . .	38	\nSubset ( $\not\subseteq$ ) . . . . .	42	\ntdtstile ( $\not\models$ ) . . . . .	39
\nsim ( $\not\sim$ ) . . . . .	36	\nSubset ( $\not\subseteq$ ) . . . . .	41	\ntheorem (package) . . . . .	73
\nsim ( $\not\sim$ ) . . . . .	34	\nSubset ( $\not\subset$ ) . . . . .	42	\nthickapprox ( $\not\approx$ ) . . . . .	35
\nsim ( $\not\sim$ ) . . . . .	38	\nsubset ( $\not\subset$ ) . . . . .	42	\nto ( $\not\rightarrow$ ) . . . . .	53
\nsimeq ( $\not\approx$ ) . . . . .	36	\nsubset ( $\not\subseteq$ ) . . . . .	42	\ntriangleeq ( $\not\approx$ ) . . . . .	47
\nsimeq ( $\not\approx$ ) . . . . .	35	\nsubseteqq ( $\not\subseteq$ ) . . . . .	42	\ntriangleleft ( $\not\leftarrow$ ) . . . . .	46
\nsimeq ( $\not\approx$ ) . . . . .	38	\nsubseteqq ( $\not\subset$ ) . . . . .	41	\ntriangleleft ( $\not\leftarrow$ ) . . . . .	46
\nsmile ( $\not\rightarrow$ ) . . . . .	55	\nsubseteqq ( $\not\subseteq$ ) . . . . .	42	\ntriangleleft ( $\not\leftarrow$ ) . . . . .	45, 47
\nsmileq ( $\not\approx$ ) . . . . .	55	\nsubseteqq ( $\not\subset$ ) . . . . .	42		

\ntrianglelefteq (⊲)	46	\nuplsquigarrow (⤳)	52	\nwvdash (⤵)	37
\ntrianglelefteq (⊳)	46	\nupmapsto (⤴)	52		
\ntrianglelefteq (⊴)	45, 47	\nupModels (⤵)	38		
\ntrianglelefteqslant (⊵)	46	\nupmodels (⤵)	38		
\ntriangleright (⊶)	46	\nuppitchfork (⤷)	54		
\ntriangleright (⊷)	46	\nuprsquigarrow (⤸)	52		
\ntriangleright (⊸)	45, 47	\nupspoon (⤹)	54		
\ntrianglerighteq (⊹)	46	\nupuparrows (⤻)	52		
\ntrianglerighteq (⊺)	46	\nupVdash (⤻)	38		
\ntrianglerighteq (⊻)	45, 47	\nupvDash (⤻)	38		
\ntrianglerighteqslant (⊻)	46	\nuup (⤻)	57		
\ntriplefrown (⊼)	55	\nvareq (⤻)	44		
\ntriplesim (⊽)	38	\nvarleq (⤻)	44		
\ntriplesmile (⊾)	55	\nvarparallel (⤻)	35		
\ntststile (⤻)	39	\nvarparallelinv (⤻)	35		
\nttstile (⤻)	39	\nVDash (⤻)	36		
\nttstile (⤻)	39	\nVDash (⤻)	34		
\ntttstile (⤻)	39	\nDash (⤻)	38		
\ntwoheaddownarrow (⤻)	52	\nDash (⤻)	36		
\ntwoheadleftarrow (⤻)	35	\nDash (⤻)	35		
\ntwoheadleftarrow (⤻)	52	\nDash (⤻)	38		
\ntwoheadnearrow (⤻)	52	\nDash (⤻)	36		
\ntwoheadnarrow (⤻)	52	\nDash (⤻)	34		
\ntwoheadnarrow (⤻)	52	\nDash (⤻)	38		
\ntwoheadrightarrow (⤻)	35	\nDash (⤻)	36		
\ntwoheadrightarrow (⤻)	52	\nDash (⤻)	38		
\ntwoheadsearrow (⤻)	52	\nDash (⤻)	38		
\ntwoheadswarrow (⤻)	52	\nDash (⤻)	36		
\ntwoheaduparrow (⤻)	52	\nDash (⤻)	34		
\nu (ν)	57	\nDash (⤻)	38		
nuclear power plant . . . . .	see \SNPP	\nDash (⤻)	36		
\NUL (␀)	81	\nDash (⤻)	34		
null infinity . . . . .	see alphabets, math	\nDash (⤻)	38		
null set . . . . .	73, 74	\nDash (⤻)	35		
number sets . . . . .	see alphabets, math	\nDash (⤻)	38		
number sign . . . . .	see \textnumero	\nDash (⤻)	36		
numbers . . . . .	see digits	\nDash (⤻)	38		
circled . . . . .	87, 105	\nDash (⤻)	36		
numerals		\nDash (⤻)	38		
Linear B . . . . .	95	\nDash (⤻)	38		
old style . . . . .	22	\nDash (⤻)	38		
\NumLock (Num)	80	\nDash (⤻)	38		
\nUparrow (⤻)	52	\nDash (⤻)	38		
\nuparrow (⤻)	52	\nDash (⤻)	38		
\nuparrowtail (⤻)	52	\nDash (⤻)	38		
\nUpdownarrow (⤻)	52	\nDash (⤻)	38		
\nupdownarrow (⤻)	52	\nDash (⤻)	38		
\nupdownarrows (⤻)	52	\nDash (⤻)	38		
\nupdownharpoonleftright (⤻)	53	\nDash (⤻)	38		
\nupdownharpoonrightleft (⤻)	53	\nDash (⤻)	38		
\nupdownharpoons (⤻)	53	\nDash (⤻)	38		
\nUpdownline (⤻)	38	\nDash (⤻)	38		
\nupdownline (⤻)	38	\nDash (⤻)	38		
\nupfilledspoon (⤻)	54	\nDash (⤻)	38		
\nupfootline (⤻)	38	\nDash (⤻)	38		
\nupfree (⤻)	38	\nDash (⤻)	38		
\nupharpoonccw (⤻)	53	\nDash (⤻)	38		
\nupharpooncw (⤻)	53	\nDash (⤻)	38		

		O
\O (Ø)	11	
\o (ø)	11	
\o (o)	57	
\oast (⊗)	28	
\oasterisk (⊗)	28	
\obackslash (⊗)	28	
\obackslash (⊗)	28	
\obar (⊕)	25	
\Obelus (—)	105	
\obelus (—)	105	
\Obelus* (÷)	105	
\obelus* (÷)	105	
\oblong (□)	25	
\obot (⊕)	28	
\obslash (⊗)	25	
\oc ()	23	
\ocirc (◎)	28	
\ocirc (◎)	28	
\ocircle (○)	25	
\coasterisk (⊗)	28	
\octagon (○)	88	
octonions (○) . . . . .	see alphabets, math	
\Octosteel (●)	82	
\od (◐)	18	
\odiv (⊕)	28	
\odot (◎)	28	
\odot (◎)	24	
\odot (◎)	28	
\odotplus (⊕)	27	
\OE (Œ)	11, 128	
\oe (œ)	11, 128	
\officialeuro (€)	21	
\offinterlineskip . . . . .	114	
ogonek (package) . . . . .	19, 130, 132	
ogonek („) . . . . .	see accents	
\greaterthan (⊗)	25	
\hill (^\wedge)	18	
ohm . . . . .	see \textohm	
\ohm (Ω)	78	
\Ohne (◐)	99	
\OHORN (○)	11	
\ohorn (◦)	11	
\oiint (fff)	31	
\oiint (fff)	33	
\oiintclockwise (fff)	31	
\oiintctr-clockwise (fff)	31	
\oint (ff)	30	
\oint (ff)	29, 31	
\oint (ff)	32	
\oint (ff)	33	
\oint (ff)	33	
\oint (ff)	33	
\ointclockwise (ff)	31	
\ointctr-clockwise (ff)	31	
\oint (ff)	30	

\oint ( $\oint$ ) . . . . .	29
\oint ( $\oint$ ) . . . . .	33
\ointclockwise ( $\oint$ ) . . . . .	31
\ointclockwise ( $\oint$ ) . . . . .	32
\ointclockwise ( $\oint$ ) . . . . .	33
\ointctrcclockwise ( $\oint$ ) . . . . .	31
\ointctrcclockwise ( $\oint$ ) . . . . .	32
\ointctrcclockwise ( $\oint$ ) . . . . .	33
old-style digits . . . . .	22
\oldstylenums . . . . .	22
\oleft ( $\oplus$ ) . . . . .	28
\olessthan ( $\ominus$ ) . . . . .	25
\Omegamega ( $\Omega$ ) . . . . .	57
\omega ( $\omega$ ) . . . . .	57
\omegamegaup ( $\omega$ ) . . . . .	57
\ominus ( $\ominus$ ) . . . . .	28
\ominus ( $\ominus$ ) . . . . .	24
\ominus ( $\ominus$ ) . . . . .	28
\onlymove ( $\square$ ) . . . . .	104
\oo ( $\circ\circ$ ) . . . . .	105
\oo ( $\circ\circ$ ) . . . . .	14
\oalign . . . . .	115
\open ( $\epsilon$ ) . . . . .	20
open unit disk ( $\mathbb{D}$ )	<i>see alphabets, math</i>
\openJoin ( $\times$ ) . . . . .	35
\openo ( $\circ$ ) . . . . .	14
\openo ( $\circ$ ) . . . . .	15
\openo ( $\circ$ ) . . . . .	14
\opentimes ( $\times$ ) . . . . .	35
operators	
binary . . . . .	24–28
logical .	<i>see logical operators</i>
set . . . . .	<i>see set operators</i>
unary . . . . .	23
\oplus ( $\oplus$ ) . . . . .	28
\oplus ( $\oplus$ ) . . . . .	23, 24, 113
\oplus ( $\oplus$ ) . . . . .	28
\opposbishops ( $\blacksquare$ ) . . . . .	104
\opposition ( $\circ^\circ$ ) . . . . .	79
optical scaling . . . . .	120
options . . . . .	<i>see package options</i>
or . . . . .	<i>see \vee</i>
OR gates . . . . .	81
	
\ORd (  ) . . . . .	81
\oright ( $\oplus$ ) . . . . .	28
	
\ORl (  ) . . . . .	81
\OrnamentDiamondSolid ( $\blacklozenge$ ) .	90
ornaments . . . . .	87, 88, 90
	
\ORr (  ) . . . . .	81
orthogonal to . . . . .	<i>see \bot</i>



\ORu (	81
\oslash (Ø)	28
\oslash (Ø)	24
\oslash (Ø)	28
\ostar (@)	28
\otimes (⊗)	28
\otimes (⊗)	24
\otimes (⊗)	28
\otop (⊕)	28
\triangle (Ⓐ)	28, 47
\triangleup (Ⓐ)	28
ovals	89
\ovee (○)	25
\overarc (⏜)	19
\overbrace (⏜)	67
\overbrace (⏜)	67
\overbrace (⏜)	67
\overbrace (⏜)	66
\overbracket (⏜)	67
\overbracket (⏜)	118, 119
\overbridge (⏜)	18
\overgroup (⏜)	67
\overgroup (⏜)	67
\overleftarrow (⟷)	66
\overleftharpoon (⟷)	54
\overleftharpoon (⟷)	54
\overleftharpoon (⟷)	67
\overleftrightarrow (⟷)	67
\overline (⏜)	23, 66
\overlinesegment (⏜)	67
\overparenthesis (⏜)	118, 119
\overrightarrow (⟷)	66
overrightarrow (package)	66, 130
\overrightarrow (⟷)	66
\overrightharpoon (⏜)	54
\overrightharpoon (⏜)	54
\overrightharpoon (⏜)	67
\overring (°)	20
\overset	114
\overleftarrow (⏜)	28
\ovoid (○)	28
\owedge (Ⓐ)	25
\owns	see \ni
\owns (Ǝ)	59
\owns (Ǝ)	60
\owns (Ǝ)	59
\ownshbar (Ǝ)	59

P

\P (¶) . . . . .	10, 127
\p (.) . . . . .	105
\p@ . . . . .	117
package options	
a (esvect) . . . . .	68

b (esvect)	68
bbgreekl (mathbbol)	76
c (esvect)	68
crescent (fge)	65
d (esvect)	68
e (esvect)	68
f (esvect)	68
g (esvect)	68
german (keystroke)	80
greek (babel)	57, 97
h (esvect)	68
integrals (wasysym)	29
mathcal (euscript)	76
mathscr (euscript)	76
nointegrals (wasysym)	29
polutonikogreek (babel)	57
sans (dsfont)	76
utf8x (inputenc)	128
varg (txfonts/pxfonts)	58
packages	
longdiv	66
accents	65, 118, 130, 132
amsbsy	124
amsfonts	24, 34, 41, 47, 73, 76
amsmath	9, 56, 65, 114, 123
amssymb	9, 24, 34, 41, 47, 65, 73, 76, 97, 130, 134
amstext	115, 117
ar	78, 130
arcs	19, 130, 131
arev	75, 98, 130, 131
ascii	81, 125, 130, 131
babel	57, 97
bbding	84–87, 89, 90, 111, 130, 131
bbm	76, 130
bbold	76, 130
bm	124, 130, 132
braket	61
calligra	76, 130, 132
calrsfs	76
cancel	66
cclicenses	21, 130, 131
centernot	115
chancery	130
chemarr	69, 130, 131
chemarrow	54, 69, 130
china2e	21, 56, 76, 77, 108, 109, 130, 132
clock	102, 130, 131
cmlt	23, 27, 33, 40, 130
colonequals	23, 41, 130, 131
combelow	19, 130, 132
cypriot	96, 130, 132
dblacnt	118
dictsym	106, 130, 131
dingbat	85, 90, 111, 130, 131
DotArrow	70, 130, 132
dozenal	72, 130

dsfont	76, 130	MnSymbol	23, 26–28, 32, 33, 36–38, 42, 45, 47, 50–55, 58, 59, 62, 65–67, 71, 74, 88, 130, 131	units	74
epsdice	103, 130, 131	nath	60, 64, 130	universa	90, 101, 130, 131
esint	32, 130	nicefrac	74, 130, 132	universal	84, 86, 90, 101, 130, 131
esvect	68, 130	ntheorem	73	upgreek	58, 130, 131
eufrak	76	ogonek	19, 130, 132	upquote	125
eurosym	21, 130, 131	overrightarrow	66, 130	url	125
euscript	76, 130	phaistos	91, 130, 131	ushort	68, 130, 132
extarrows	69, 130, 131	phonetic	15, 18, 113, 130	vietnam	130
extpfeil	70, 130, 131	pict2e	79	vntex	11, 16
extraipa	18, 130	pifont	12, 84–88, 90, 113, 130	wasysym	14, 20, 22, 24, 25, 29, 34, 35, 41, 43, 47, 71, 73, 78–80, 82, 86–88, 98, 111, 130
fc	11, 16	pigpen	108, 130, 131	wsipa	14, 18, 20, 111, 113, 118, 130, 131
fclfont	130	pmboxdraw	107, 130, 131	xfrac	74
feyn	83, 130, 131	polynom	66	yfonts	76, 77, 130, 131
fge	54, 60, 65, 72, 75, 130, 131	protosem	91, 130, 131	yhmath	66, 68, 71, 117, 130
fixmath	124	psnfss	87	Pakin, Scott	1, 118, 129
fontenc	9, 11, 16, 126	pxfonts	23–25, 31, 34, 35, 41, 43, 47, 49, 55, 57–59, 73, 76, 110, 125	\PaperLandscape ()	102
fontspec	129	recycle	109, 130	\PaperPortrait ()	102
fourier	21, 41, 58, 60, 64, 68, 85, 88, 101, 130	rotating	21, 80	par	<i>see</i> \bindnasrepma, \invamp, and \parr
gensymb	78	sarabian	97, 130, 132	paragraph mark	<i>see</i> \P
graphics	54, 113	savesym	110	\parallel (  )	34, 63
graphicx	19, 110, 113	semtrans	15, 19, 130, 131	\parallel (  )	37
harmony	99, 130, 131	shuffle	27, 130, 131	\ParallelPort ()	80
harpoon	54, 130, 132	simplewick	119	\parallelslant (//)	41
hhcount	103, 130, 132	simpsons	106, 130	\parr (♂)	27
hieroglif	92, 130, 131	skak	104, 130, 131	\partial ()	59
holtpolt	70, 130	skull	103, 130, 131	\partial ()	59
ifsym	78, 89, 101, 102, 111, 113, 130, 131	slashed	115	\partial ()	60
igo	105, 130	staves	107, 130	\partialslash ()	59
inputenc	128	steinmetz	79, 130, 132	\partialvardint (⋯)	74
isoent	126	stmaryrd	25, 29, 34, 41, 46, 48, 55, 60, 62, 111, 115, 129, 130	\partialvardanddownint (˘)	74
junicode	129	t4phonet	15, 19, 130, 131	\partialvardandupint (˘)	74
keystroke	80, 130, 131	teubner	21, 72, 97, 106, 130, 131	\partialvardlcircleleftint (○)	50
latexsym	24, 34, 41, 47, 73, 110, 130	textcomp	9, 10, 16, 20–22, 48, 65, 74, 78, 98, 110, 125, 126, 130	\partialvardlcircleleftint (○)	74
linearA	92, 130, 131	timing	78	\partialvardlcirclerightint (○)	50
linearb	95, 96, 130, 131	tipa	12, 13, 15–17, 19, 113, 130, 131	\partialvardlcirclerightint (○)	74
manfnt	99, 100, 130	tipx	13, 130, 131	\partialvardoint (○)	74
marvosym	20, 72, 74, 79, 80, 82, 84, 100, 101, 111	trfsigns	40, 59, 70, 130	\partialvardrcircleleftint (○)	50
mathabx	23, 26, 28, 30, 34, 36, 41, 42, 44, 46, 49, 56, 59–62, 65, 67, 72, 73, 79, 103, 110, 111, 130, 131, 134	trsym	40, 130, 131	\partialvardrcircleleftint (○)	74
mathbbol	76	turnstile	39, 40, 130, 131	\partialvardrcirclerightint (○)	50
mathcomp	72	txfonts	23–25, 31, 34, 35, 41, 43, 47, 49, 55, 57–59, 73, 76, 110, 112, 125, 130, 131	\partialvardrcirclerightint (○)	74
mathdesign	20, 27, 33, 60, 63, 75, 130	type1cm	110	\partialvardrcirclerightint (○)	74
mathdots	65, 70, 71, 117, 130, 131	ucs	128	\partialvardstrokedint (˘)	74
mathrsfs	76, 130	ulsy	27, 55, 113, 130	\partialvardsumint (Σ)	74
mathtools	23, 39, 67, 69, 130, 131	underscore	10	\partialvartrint (⋯)	74
mbboard	76, 130	undertilde	68, 130, 131		
metre	18, 65, 105, 130, 131				
milstd	81, 130				

\partial	74
\partialarc	74
\partialcircle	50
\partialcirclearc	74
\partialcirclearcright	50
\partialcirclearcrightint	74
\partialvartoint	74
\partialvaroint	74
\partialvartrc	50
\partialvartrc	74
\partialvartrc	50
\partialvartrc	74
\partialvartstroke	74
\partialvarts	74
particle-physics symbols	83
parts per thousand	<i>see</i> \textperthousand
\partvoice	18
\partvoiceless	18
\passedpawn	104
pawn	104
\pdfLATEX	129
\Peace	90
\PencilLeft	85
\PencilLeftDown	85
\PencilLeftUp	85
\PencilRight	85
\PencilRightDown	85
\PencilRightUp	85
pencils	85
\pentagon	88
\pentagram	28
\pentam	106
people	<i>see</i> faces
percent sign	<i>see</i> \%
\permil	22
\Perp	35
\perp	34, 116
\perp	37
\perthousand	78
\Pfund	20
\PgDown	80
\PgUp	80
phaistos (package)	91, 130, 131
Phaistos disk	91
pharmaceutical prescription	<i>see</i> \textrecipe
\PHarrow	91
\phase	79
phasor	79
\PHbee	91
\PHbeehive	91
\PHboomerang	91
\PHbow	91
\PHbullLeg	91
\PHcaptive	91
\PHcarpentryPlane	91
\PHcat	91
\PHchild	91
\PHclub	91
\PHcolumn	91
\PHcomb	91
\PHdolium	91
\PHdove	91
\PHeagle	91
\PHflute	91
\PHgaunlet	91
\PHgrater	91
\PHhelmet	91
\PHhide	91
\PHhorn	91
\Phi	57
\phi	57
\phiip	57
\PHlid	91
\PHlily	91
\PHmanacles	91
\PHmattock	91
\Phone	90
\phone	98
\PhoneHandset	90
phonetic (package)	15, 18, 113, 130
phonetic symbols	12–15
\photon	78
photons	83
\PHoxBack	91
\PHpapyrus	91
\PHpedestrian	91
\PHplaneTree	91
\PHplumedHead	91
\PHram	91
\PHrosette	91
\PHsaw	91
\PHshield	91
\PHship	91
\PHsling	91
\PHsmallAxe	91
\PHtrainer	91
\PHtattooedHead	91
\PHTiara	91
\PHTunny	91
\PHvine	91
\PHwavyBand	91
\PHwoman	91
physical symbols	78
\Pi	57
\pi	57
\pi	58
\Pickup	82
pict2e (package)	79
pifont (package)	12, 84–88, 90, 113, 130
\pigpen	108, 130, 131
pigpen cipher	108
\pigpenfont A}	(└)
\pigpenfont B}	(┘)
\pigpenfont C}	(└)
\pigpenfont D}	(┘)
\pigpenfont E}	(□)
\pigpenfont F}	(□)
\pigpenfont G}	(┐)
\pigpenfont H}	(┐)
\pigpenfont I}	(┌)
\pigpenfont J}	(└)
\pigpenfont K}	(┘)
\pigpenfont L}	(└)
\pigpenfont M}	(┘)
\pigpenfont N}	(□)
\pigpenfont O}	(└)
\pigpenfont P}	(┐)
\pigpenfont Q}	(┐)

\pigpenfont R} (F)	108	\Postbox (✉)	109	\proto ( $\infty$ )	73
\pigpenfont S} (V)	108	PostScript	58, 77, 84, 113, 122	\proto ( $\infty$ )	34
\pigpenfont T} (>)	108	PostScript fonts	84, 113	\proto ( $\infty$ )	37
\pigpenfont U} (<)	108	\Pound (£)	21	proto-Semitic symbols	91
\pigpenfont V} (^)	108	\pounds (£)	10, 126, 127	protosem (package)	91, 130, 131
\pigpenfont W} (V)	108	power set	see alphabets, math	\ProvidesPackage	130
\pigpenfont X} (>)	108	\powerset ( $\wp$ )	59	\PrtSc (PrtSc)	80
\pigpenfont Y} (<)	108	\Pp (:)	105	\ps (✉)	105
\pigpenfont Z} (^)	108	\pp (:)	105	pseudographics	107
pilcrow	see \P	\ppp (:)	105	\Psi ( $\Psi$ )	57
pipe	see \textpipe	\ppp (:)	105	\psi ( $\psi$ )	57
\Pisces (♓)	79	\pppp (:)	105	\psiup ( $\psi$ )	57
\pisces (♓)	79	\ppppp (:)	105	psnfss (package)	87
\Pisymbol	113	\ppppp (:)	105	\Pu (.)	99
\pitchfork (担负)	73	\ppppp (:)	105	pullback diagrams	117
\pitchfork (担负)	34	\Pr (Pr)	56	pulse diagram symbols	78
\pitchfork (担负)	54	\prec (<)	34	\PulseHigh (↑)	78
pitchfork symbols	34, 54, 73	\prec (<)	37	\PulseLow (↓)	78
Pitman's base-12 symbols	72	\precapprox ( $\approx$ )	36	punctuation	11, 12
\piup ( $\pi$ )	57	\precapprox ( $\approx$ )	34	pushout diagrams	117
\planck (h)	15	\precapprox ( $\approx$ )	37	\pwedge ( $\Lambda$ )	15
\Plane (✈)	90	\preccurlyeq ( $\lessapprox$ )	36	pxfonts (package)	23–25,
planets	79	\preccurlyeq ( $\lessapprox$ )	34	31, 34, 35, 41, 43, 47, 49, 55,	
playing cards	see card suits	\preccurlyeq ( $\lessapprox$ )	37	57–59, 73, 76, 110, 125	
Plimsoll line	115	\precdot (<)	36	\Pxp (:)	105
\Plus (+)	86	\preceq ( $\preceq$ )	34	\pxp (:)	105
\plus (+)	27	\preceq ( $\preceq$ )	37		
plus-or-minus sign	see \pm	\preceqq ( $\preceqq$ )	35	<b>Q</b>	
\PlusCenterOpen (⊕)	86	\precnapprox ( $\approx$ )	36	Q.E.D.	73
\pluscirc (⊕)	26	\precnapprox ( $\approx$ )	34	\qoppa (ϙ)	97
\PlusOutline (⊕)	86	\precnapprox ( $\approx$ )	38	\qside (ϙ)	104
plusses	86	\precneq ( $\lessdot$ )	36	\Quadrad (□)	65
\PlusThinCenterOpen (⊕)	86	\precneqq ( $\lessdot$ )	35	\quadrad (□)	65
\Pluto (♃)	79	\precnsim ( $\approx$ )	36	\Quadas (□)	65
\Pluto (♄)	79	\precnsim ( $\approx$ )	34	\quadas (□)	65
\pluto (♃)	79	\precnsim ( $\approx$ )	38	quarter note	see musical symbols
\pm (±)	24	\precsim ( $\approx$ )	36	\quarternote (♩)	98
\pm (±)	27	\precsim ( $\approx$ )	34	\quarternote (♩)	98
\pm (±)	105	\precsim ( $\approx$ )	37	quaternions (III)	see alphabets, math
\pmb	124	prescription	see \textrecipe	quaver	see musical symbols
\pmboxdraw (package)	107, 130, 131	present-value symbols	118	queen	104
\pmod	56	\prime ()	73	\quotedblbase („)	11, 128
\pod	56	\prime ()	74	\quotesinglbase („)	11, 128
\pointer (◊)	98	\Printer (🖨)	80		
pointing finger	see fists	printer's fist	see fists	<b>R</b>	
\Pointinghand (☞)	100	probabilistic independence	116	\R (~)	105
\polishhook (¸)	20	\prod ( $\prod$ )	29	\r (ऋ)	16
\polter (████)	70	\prod ( $\prod$ )	33	\r (~)	105
polutonikogreek (babel package option)	57	projective space ( $\mathbb{P}$ )	see alphabets, math	\Radiation (☢)	102
polygons	88	\projlim (proj lim)	56	radicals	see \sqrt and \surd
\polynom (package)	66	pronunciation symbols	see phonetic symbols	\Radioactivity (☣)	82
polynomial division	66	proof, end of	73	\Rain (🌧)	101
polytonic Greek	57	proper subset/superset	see \subsetneq/\supsetneq	\RainCloud (ฝน)	101
		proper vertices	83	raising	see \textraising
				\RaisingEdge (↗)	78
				\Range (➤)	76
				\rAngle (》)	64

\rangle	61
\rangle	62
\rangle	62
\rightarrow (	80
\rightarrowfill	69
\ratio (:	41
\RATIONAL (Q)	56
\Rational (Q)	56
rational numbers (Q)	see alphabets, math
rationalized Planck constant	see \hbar
\Rbag (J)	60
\rbag (J)	60
\rbrace (}	62
\Rbrack (])	76
\rBrack (])	64
\rc (z)	18
\rCeil (])	64
\rceil (])	61
\rceil (])	62
\rcirclearrowdown (Ω)	50
\rcirclearrowleft (○)	50
\rcirclearrowright (○)	50
\rcirclearrowup (○)	50
\rcircleleftint (ֆ)	33
\rcirclerightint (ֆ)	33
\rcorners (')	60
\rcurarrowdown (↳)	50
\rcurarrowleft (↖)	50
\rcurarrowne (↗)	50
\rcurarrownw (↖)	50
\rcurarrowright (↗)	50
\rcurarrowse (↘)	51
\rcurarrowsw (↙)	51
\rcurarrowup (↑)	51
\rdbrack (])	62
\Re (R)	59
\REAL (R)	56
\Real (R)	56
real numbers (R)	see alphabets, math
recipe	see \textrecipe
\recorder (O)	98
\Rectangle (I)	89
\RectangleBold (■)	89
rectangles	89, 90
\RectangleThin (I)	89
\Rectpipe (▣)	82
\Rectsteel (■)	82
recycle (package)	109, 130
\recycle (	109
recycling symbols	109
reduced quadrupole moment	see \rqqm
\reflectbox	113
registered trademark	see \textregistered
relational symbols	34
binary	34–36, 39–45, 54, 55
negated binary	34–36, 38
triangle	46, 47
\Relbar (=)	55, 114
\Relbar (=)	37
\relbar (–)	55, 114
\relbar (–)	37
\Request (?)	109
\resizebox	54, 110
\Respondens (~)	105
\respondens (~)	105
response (R)	129
\restoresymbol	110
\restriction	see \upharpoonright
\restriction (†)	49
\restriction (†)	53
retracting	see \textretracting
\Return (➡)	80
return	see carriage return
\revaw (}}	63
\revD (D)	15
\revdots (..)	117
\reve (s)	14
\reveject (s)	14
\revepsilon (3)	14, 113
reverse solidus	see \textbackslash
reversed symbols	113
\reversedvideobend (Z)	99
\revglotstop (g)	14
\Rewind (◀)	100
\RewindToIndex (◀◀)	100
\RewindToStart (◀)	100
\rfilet (}}	62
\rfloor (])	64
\rfloor (])	61
\rfloor (])	62
\rgroup (})	61
\rgroup (})	62
\RHD (►)	25
\rhd (▷)	24, 25
\rhd (▷)	45, 47
\rho (ρ)	57
\rho (ρ)	58
\rhookdownarrow (↓)	51
\rhookleftarrow (←)	51
\rhooknarrow (↗)	51
\rhooknarrow (↖)	51
\rhookrightarrow (→)	51
\rhooksearrow (↘)	51
\rhookswarrow (↙)	50
\rhookuparrow (↑)	50
\rhoup (ρ)	57
\right . . . . .	61, 63, 64, 110, 112
\rightangle (L)	75
\RIGHTarrow (►)	98
\Rightarrow (⇒)	23, 47
\Rightarrow (⇒)	50
\rightarrow (→)	49
\rightarrow (→)	47
\rightarrow (→)	50
\rightarrowtail (→)	48
\rightarrowtail (→)	50
\rightarrowtriangle (→)	48
\rightbarharpoon (⇒)	49
\RIGHTCIRCLE (●)	98
\RIGHTcircle (●)	98
\Rightcircle (●)	98
\RightDiamond (◆)	89
\rightevaw (}}	63
\rightfilledspoon (→)	54
\rightfootline (→)	37
\rightfree (→)	37
\righthalfcap (⊸)	27
\righthalfcup (⊸)	27
\righthand (✉)	85
\rightharpoonccw (→)	53
\rightharpooncw (→)	53
\rightharpoondown (→)	49
\rightharpoondown (→)	48
\rightharpoonup (→)	49
\rightharpoonup (→)	48
\rightleftarrows (↔)	49
\rightleftarrows (↔)	48
\rightleftarrows (⇄)	50
\rightleftharpoon (→)	49
\rightleftharpoons (⇒)	49
\rightleftharpoons (⇒)	48
\rightleftharpoons (⇒)	48
\rightleftharpoons (⇒)	53
\rightleftharpoonsfill . . . . .	69
\rightlsquigarrow (↝)	50
\rightmapsto (→)	50
\rightModels (\models)	37
\rightmodels (\models)	37
\rightmoon (☽)	79
\rightmoon (☽)	79
\righttp (⊸)	20
\rightpitchfork (≡)	54

\rightpointleft (✉)	85	\roty (⤤)	15	\Sampi (⤧)	97
\rightpointright (👉)	85	\RoundedLsteel (⤨)	82	\sampi (⤧)	97
\rightproto (♾)	37	\RoundedTsteel (⤩)	82	\SAN (⤪)	97
\rightrightarrows (⤳)	49	\RoundedTTsteel (⤪)	82	sans (dsfont package option)	76
\rightrightarrows (⤴)	48	\Rparen (⤵)	76	\SAO (⤠)	97
\rightrightarrows (⤵)	50	\rqm (⤶)	115	\SAQ (⤷)	97
\rightrightharpoons (⤶)	49	\rrangle (⤵)	62	\SAR (⤸)	97
\rightrsquigarrow (⤷)	50	\rrbracket (⤵)	62	\sarabfamily	97
\Rightscissors (⤻)	84	\rrbracket (⤵)	64	sarabian (package)	97, 130, 132
\rightslice (⤹)	25	\rrceil (⤵)	60	\SAS (⤺)	97
\rightslice (⤹)	37	\rrfloor (⤵)	60	\SAsa (⤺)	97
\rightspoon (⤸)	54	\Rrightarrow (⤴)	49	\SAsd (⤺)	97
\rightsquigarrow (⤷)	49	\Rrightarrow (⤴)	50	\SAsv (⤠)	97
\rightsquigarrow (⤸)	48	\rrparenthesis (⤵)	60	\SAT (⤫)	97
\rightsquigarrow (⤹)	51	\RS (⤲)	81	\SATb (⤺)	97
\rightt (⤵)	20	\rsem (⤵)	62	\SATd (⤵)	97
\righttherefore (⤵)	26, 71	\rsemantic	<i>see</i> \rdbrack	\satellitedish (⤦)	90
\rightthreetimes (⤸)	73	\Rsh (⤵)	49	satisfies	<i>see</i> \models
\rightthreetimes (⤸)	24	\Rsh (⤵)	48	\Saturn (⤰)	79
\rightthreetimes (⤸)	26	\Rsh (⤵)	50	\Saturn (⤱)	79
\rightthumbsdown (✉)	85	\rtimes (⤸)	26	\saturn (⤠)	79
\rightthumbsup (👉)	85	\rtimes (⤸)	24	savesym (package)	110
\righttoleftarrow (⤵)	49	\rtimes (⤸)	26	\savesymbol	110
\Righttorque (⤲)	82	\rtriple	64	\SAW (⤰)	97
\rightturn (⤵)	98	\rVert (⤵)	64	\SAY (⤷)	97
\rightVdash (⤵)	37	\rVert (⤵)	61	\SAZ (⤺)	97
\rightvdash (⤵)	37	\rvert (⤵)	61	\SAzd (⤷)	97
\rightwave (⤵)	63	\rwave (⤵)	63	\Sborder (⤵)	90
\rightY (⤸)	26	\rWavy (⤵)	62	\scalebox	110
\ring (⤰)	66	\rwave (⤵)	62	scaling	
ring (⤰)	<i>see</i> accents			mechanical	120, 122
ring equal to	<i>see</i> \circeq			optical	120
ring in equal to	<i>see</i> \eqcirc			\scd (⤰)	14
\riota (⤠)	15			\scg (⤰)	14
\rip (⤰)	103			\schwa (⤠)	14
\risingdotseq (⤵)	36			\schwa (⤠)	15
\risingdotseq (⤵)	34			Schwartz distribution spaces	<i>see</i> alphabets, math
\risingdotseq (⤵)	37			\sci (⤰)	14
\rJoin (⤸)	35			scientific symbols	78–83
\rlap	89, 116, 117			\ScissorHollowLeft (⤰)	84
\rmoustache (⤵)	61			\ScissorHollowRight (⤰)	84
\rmoustache (⤵)	62			\ScissorLeft (⤰)	84
Roman coins	21			\ScissorLeftBrokenBottom (⤰)	84
Romanian comma-belo accent (⤰)	<i>see</i> accents			\ScissorLeftBrokenTop (⤰)	84
rook	104			\ScissorRight (⤰)	84
roots	<i>see</i> \sqrt			\ScissorRightBrokenBottom (⤰)	84
\rotatebox	19, 113			\ScissorRightBrokenTop (⤰)	84
rotated symbols	12–15, 19, 113			scissors	84, 85
rotating (package)	21, 80			\scn (⤰)	14
\rotm (⤰)	15			\scoh (⤰)	40
\rotOmega (⤰)	15			\Scorpio (⤰)	79
\rotr (⤰)	15			\scorpio (⤰)	79
\rotvara (⤰)	15			\scr (⤰)	14
\rotw (⤰)	15				

script letters	<i>see alphabets, math</i>
\scripta (a)	14
\scriptg (g)	14
\scriptscriptstyle	116
\scriptstyle	116
\scriptv (v)	14
\Scroll ( [Scroll] )	80
\scu (U)	14
\scy (Y)	14
\sddtstile ( [ ] )	39
\sdststile ( [ ] )	39
\sdtstile ( [ ] )	39
\sdttstile ( [ ] )	39
seagull	<i>see \textseagull</i>
\Searrow ( ↘ )	49
\Searrow ( ↙ )	50
\searrow ( ↘ )	49
\searrow ( ↙ )	47, 117
\searrow ( ↘ )	50
\searrowtail ( ↘ )	50
\sec (sec)	56
\Sech (♪)	99
\SechBL (♪)	99
\SechB1 (♪)	99
\SechBR (♪)	99
\SechBr (♪)	99
\second (//)	73
seconds, angular	<i>see \second</i>
\secstress (,)	20
section mark	<i>see \S</i>
\SectioningDiamond (◊)	102
sedenions (\$)	<i>see alphabets, math</i>
\sefilledspoon ( ↘ )	54
\sefootline ( ↘ )	37
\sefree ( ↘ )	37
segmented digits	78
\seharpoonccw ( ↘ )	53
\seharpooncw ( ↘ )	53
\selectfont	9
\selsquigarrow ( ↘ )	50
semantic valuation	62, 64
\semapsto ( ↘ )	50
semibreve	<i>see musical symbols</i>
semidirect products	24, 26, 73
semiquaver	<i>see musical symbols</i>
semitic transliteration	15, 19
\seModels (◊)	37
\semmodels (◊)	37
semtrans (package)	15, 19, 130, 131
\senwarrows ( ☈ )	50
\senharpoons ( ☈ )	53
\SePa (ˇ)	99
\separated ( ))	37
\sepitchfork ( ☈ )	54
\seppawns (◦◦)	104
\SerialInterface ( ☉ )	80
\SerialPort ( ☉ )	80
\sersquigarrow ( ↘ )	50
\sesearrows ( ☈ )	50
\sespoon ( ↘ )	54
set operators	
intersection	<i>see \cap</i>
membership	<i>see \in</i>
union	<i>see \cup</i>
\setminus ( \backslash )	24
\setminus ( ↘ )	27
\seVdash ( ☈ )	36
\sevdash ( ↈ )	37
SGML	126
sha (III)	113
\sharp (#)	73, 98
\sharp (#)	74
\shfermion ( ◻ )	83
\Shift ( [Shift ↑] )	80
\shift ( ♫ )	23
\Shilling (β)	20
\shneg (↑)	23
\shortcastling (O-O)	104
\shortdownarrow ( ↓ )	48
\ShortFifty ( ☉ )	100
\ShortForty ( ☉ )	100
\shortleftarrow ( ← )	48
\shortmid (   )	34
\shortmid (   )	27
\ShortNinetyFive ( ☉ )	100
\shortparallel (    )	34
\shortparallel (    )	36
\ShortPulseHigh ( JL )	78
\ShortPulseLow ( JT )	78
\shortrightarrow ( → )	48
\ShortSixty ( ☉ )	100
\ShortThirty ( ☉ )	100
\shortuparrow ( ↑ )	48
\showclock	102
\shpos ( ↓ )	23
shuffle (package)	27, 130, 131
\shuffle ( ⊞ )	27
shuffle product ( ⊞ )	27
\SI ( * )	81
\Sigma (Σ)	57
\sigma (σ)	57
\sigmaup (σ)	57
\sim ( ~ )	34, 114, 125
\sim ( ~ )	36
\simcolon ( ~: )	41
\simcoloncolon ( ~:: )	41
\simeq ( ≈ )	34
\simeq ( ≈ )	36
simplewick (package)	119
simpsons (package)	106, 130
Simpsons characters	106
\sin (sin)	56
\sincoh ( ~ )	40
\sinh (sinh)	56
\SixFlowerAlternate (✿)	87
\SixFlowerAltPetal (✿)	87
\SixFlowerOpenCenter (✿)	87
\SixFlowerPetaldotted (✿)	87
\SixFlowerPetalRemoved (✿)	87
\SixFlowerRemovedOpenPetals (✿)	87
\SixStar (★)	87
\SixteenStarLight (※)	87
sixteenth note	<i>see musical symbols</i>
\sixteenthnote (♪)	98
skak (package)	104, 130, 131
skull (package)	103, 130, 131
\skull (💀)	103
\slash ( / )	125
\slashb ( ⍟ )	14
\slashc ( ø )	14
\slashd ( ⍀ )	14
\slashdiv ( ↘ )	26
slashed (package)	115
\slashed	115
slashed letters	115
\slashed.sty (file)	115
\slashu (ゅ)	14
\Sleet ( ☈ )	101
\sliding ( ☉ )	18
\smallbosonloops ( ☉ )	83
\smallbosonloopA ( ☉ )	83
\smallbosonloopVs ( ☉ )	83
\SmallCircle (○)	89
\SmallCross (×)	89
\smalldiamond (◊)	28
\SmallDiamondshape (◊)	89
\smallfrown ( ~ )	34
\smallfrown ( ~ )	55
\SmallHBar ( − )	89
\smallin ( ε )	60
\smallint ( ∫ )	74
\SmallLowerDiamond ( ♦ )	89
\smalllozenge ( ◊ )	88
\smalllows ( ☉ )	60
\smallpencil ( ☉ )	85
\smallprod ( ∏ )	26
\SmallRightDiamond ( ♦ )	89
\smallsetminus ( ↘ )	24
\smallsetminus ( ↘ )	27
\smallsmile ( ~ )	34
\smallsmile ( ~ )	55
\SmallSquare ( □ )	89
\smallsquare ( □ )	28
\smallstar ( * )	28
\SmallTriangleDown ( ∇ )	89
\smalltriangledown ( ∇ )	28

\smalltriangledown (▽)	28, 47	\spirituslenis (՞)	65	\sqsupseteq (⊍)	42																																																																																																																																																																																																										
\SmallTriangleLeft (◀)	89	\splitvert (፣)	81	\sqsupseteqq (⊏)	41																																																																																																																																																																																																										
\smalltriangleleft (◀)	28	spoon symbols	54	\sqsupseteqq (⊐)	42																																																																																																																																																																																																										
\smalltriangleleft (◀)	28, 47	\spreadlips (՞)	18	\sqsupseteqqq (⊑)	42																																																																																																																																																																																																										
\SmallTriangleRight (▷)	89	\sqbullet (■)	26	\sqsupseteqqq (⊒)	42																																																																																																																																																																																																										
\smalltriangleright (▷)	28	\sqcap (□)	26	\sqsupsetneq (⊕)	42																																																																																																																																																																																																										
\smalltriangleright (▷)	28, 47	\sqcap (□)	24	\sqsupsetneq (⊔)	42																																																																																																																																																																																																										
\SmallTriangleUp (△)	89	\sqcap (□)	26	\sqsupsetneqq (⊕)	42																																																																																																																																																																																																										
\smalltriangleup (△)	28	\sqcapdot (▣)	26	\sqsupsetneqq (⊔)	42																																																																																																																																																																																																										
\smalltriangleup (△)	28, 47	\sqcapplus (▣)	25	\sqtriplefrown (❀)	55																																																																																																																																																																																																										
\SmallVBar (፤)	89	\sqcapplus (▣)	26	\sqtriplesmile (❀)	55																																																																																																																																																																																																										
\smile (⌣)	34	\sqcup (□)	26	\Square (□)	89																																																																																																																																																																																																										
\smile (⌣)	55	\sqcup (□)	23, 24	\Square (□ vs. □ vs. □)	111																																																																																																																																																																																																										
smile symbols	55	\sqcup (□)	26	\Square (□)	86																																																																																																																																																																																																										
\smileeq (₌)	55	\sqcupdot (□)	26	\Square (□)	89																																																																																																																																																																																																										
\smileeqfrown (Ӯ)	55	\sqcupplus (▣)	25	\square (□)	26																																																																																																																																																																																																										
\smilefrown (Ӯ)	55	\sqcupplus (▣)	26	\square (□)	73																																																																																																																																																																																																										
\smilefrowneq (Ӯ)	55	\sqdoublecap (▣)	26	\square (□)	28																																																																																																																																																																																																										
\Smiley (☺)	101	\sqdoublecup (▣)	26	square root	<i>see</i> \sqrt																																																																																																																																																																																																										
\smiley (☺)	98	\sqdoublefrown (❀)	55	smiley faces	81, 98, 101, 108	\sqdoublefrown (❀)	55	hooked	<i>see</i> \hksqrt	\sndtstile (   )	40	\sqdoublefrowneq (߱)	55	\SquareCastShadowBottomRight (□)	89	\Snow (❄)	101	\sqdoublefrowneq (߱)	55	\SquareCastShadowTopLeft (□)	89	\SnowCloud (🌨)	101	\sqfrown (߼)	55	\SquareCastShadowTopRight (□)	89	\Snowflake (❄)	87	\sqfrowneq (߲)	55	\Squaredot (·)	74	\SnowflakeChevron (❄)	87	\sqfrownqsmile (߱)	55	\squaredots (,:)	26, 71	\SnowflakeChevronBold (❄)	87	\sqfrownsmile (߲)	55	\Squarepipe (▣)	82	snowflakes	87, 88	\sqiiint (ܵܵܵ)	31	squares	89–90, 105	\SNPP (ܵܵܵ)	106	\sqiint (ܵܵ)	31	\SquareShadowA (□)	89	\snststile (   )	40	\sqint (ܵ)	32	\SquareShadowB (▣)	89	\sntstile (▣)	40	\sqint (ܵ)	32	\SquareShadowBottomRight (□)	89	\snttstile (   )	40	\sqrt (√)	66, 116–117	\SquareShadowC (□)	89	\SO (ܵ)	81	\sqsmile (߼)	55	\SquareShadowTopLeft (□)	89	\SOH (ܵ)	81	\sqsmileeq (߲)	55	\SquareShadowTopRight (□)	89	South Arabian alphabet	97	\sqsmileeqfrown (Ӯ)	55	\SquareSolid (■)	89	space		\sqsmilefrown (߱)	55	\Squaresteel (■)	82	thin	123	\Sqsubset (ܵ)	42	\squarewithdots (ܵܵܵ)	90	visible	<i>see</i>	\sqSubset (ܵܵ)	42	\squigarrowdownup (ܵ)	50	\textrivisiblespace		\sqsubset (□)	42	\squigarrowleftright (ܵܵ)	50	\Spacebar (ܵܵܵ)	80	\sqsubset (□)	42	\squigarrownesw (ܵܵ)	50	spades (suit)	73–75, 90	\sqsubset (□)	42	\squigarrownwse (ܵ)	50	\spadesuit (♠)	73	\sqsubset (□)	42	\squigarrowrightleft (ܵܵ)	50	\spadesuit (♦)	74	\sqsubset (□)	42	\squigarrowsenw (ܵ)	50	\Sparkle (✿)	87	\sqsubset (□)	42	\squigarrowswne (ܵܵ)	50	\SparkleBold (✿)	87	\sqsubset (□)	42	\squigarrowupdown (ܵ)	50	sparkles	87, 88	\sqsubset (□)	42	\squplus (▣)	26	“special” characters	10	\sqsubset (□)	42	\SS (SS)	11	\SpecialForty (ܵܵܵܵ)	100	\sqsubset (□)	42	\ss (ܵ)	11	\sphericalangle (❀)	73	\sqsubset (□)	42	\ssdtstile (   )	40	\sphericalangle (◀)	73	\sqsubset (□)	42	\ssearrow (ܵ)	48	\sphericalangle (◀)	74	\sqsubset (□)	42	\sslash (//)	25	\SpinDown ()↓	89	\sqsubset (□)	41	\ssststile (   )	40	\SpinUp ()↑	89	\sqsubset (□)	41			\spirituslenis (՞)	65				
smiley faces	81, 98, 101, 108	\sqdoublefrown (❀)	55	hooked	<i>see</i> \hksqrt																																																																																																																																																																																																										
\sndtstile (   )	40	\sqdoublefrowneq (߱)	55	\SquareCastShadowBottomRight (□)	89																																																																																																																																																																																																										
\Snow (❄)	101	\sqdoublefrowneq (߱)	55	\SquareCastShadowTopLeft (□)	89																																																																																																																																																																																																										
\SnowCloud (🌨)	101	\sqfrown (߼)	55	\SquareCastShadowTopRight (□)	89																																																																																																																																																																																																										
\Snowflake (❄)	87	\sqfrowneq (߲)	55	\Squaredot (·)	74																																																																																																																																																																																																										
\SnowflakeChevron (❄)	87	\sqfrownqsmile (߱)	55	\squaredots (,:)	26, 71																																																																																																																																																																																																										
\SnowflakeChevronBold (❄)	87	\sqfrownsmile (߲)	55	\Squarepipe (▣)	82																																																																																																																																																																																																										
snowflakes	87, 88	\sqiiint (ܵܵܵ)	31	squares	89–90, 105																																																																																																																																																																																																										
\SNPP (ܵܵܵ)	106	\sqiint (ܵܵ)	31	\SquareShadowA (□)	89																																																																																																																																																																																																										
\snststile (   )	40	\sqint (ܵ)	32	\SquareShadowB (▣)	89																																																																																																																																																																																																										
\sntstile (▣)	40	\sqint (ܵ)	32	\SquareShadowBottomRight (□)	89																																																																																																																																																																																																										
\snttstile (   )	40	\sqrt (√)	66, 116–117	\SquareShadowC (□)	89																																																																																																																																																																																																										
\SO (ܵ)	81	\sqsmile (߼)	55	\SquareShadowTopLeft (□)	89																																																																																																																																																																																																										
\SOH (ܵ)	81	\sqsmileeq (߲)	55	\SquareShadowTopRight (□)	89																																																																																																																																																																																																										
South Arabian alphabet	97	\sqsmileeqfrown (Ӯ)	55	\SquareSolid (■)	89																																																																																																																																																																																																										
space		\sqsmilefrown (߱)	55	\Squaresteel (■)	82																																																																																																																																																																																																										
thin	123	\Sqsubset (ܵ)	42	\squarewithdots (ܵܵܵ)	90																																																																																																																																																																																																										
visible	<i>see</i>	\sqSubset (ܵܵ)	42	\squigarrowdownup (ܵ)	50																																																																																																																																																																																																										
\textrivisiblespace		\sqsubset (□)	42	\squigarrowleftright (ܵܵ)	50																																																																																																																																																																																																										
\Spacebar (ܵܵܵ)	80	\sqsubset (□)	42	\squigarrownesw (ܵܵ)	50																																																																																																																																																																																																										
spades (suit)	73–75, 90	\sqsubset (□)	42	\squigarrownwse (ܵ)	50																																																																																																																																																																																																										
\spadesuit (♠)	73	\sqsubset (□)	42	\squigarrowrightleft (ܵܵ)	50																																																																																																																																																																																																										
\spadesuit (♦)	74	\sqsubset (□)	42	\squigarrowsenw (ܵ)	50																																																																																																																																																																																																										
\Sparkle (✿)	87	\sqsubset (□)	42	\squigarrowswne (ܵܵ)	50																																																																																																																																																																																																										
\SparkleBold (✿)	87	\sqsubset (□)	42	\squigarrowupdown (ܵ)	50																																																																																																																																																																																																										
sparkles	87, 88	\sqsubset (□)	42	\squplus (▣)	26																																																																																																																																																																																																										
“special” characters	10	\sqsubset (□)	42	\SS (SS)	11																																																																																																																																																																																																										
\SpecialForty (ܵܵܵܵ)	100	\sqsubset (□)	42	\ss (ܵ)	11																																																																																																																																																																																																										
\sphericalangle (❀)	73	\sqsubset (□)	42	\ssdtstile (   )	40																																																																																																																																																																																																										
\sphericalangle (◀)	73	\sqsubset (□)	42	\ssearrow (ܵ)	48																																																																																																																																																																																																										
\sphericalangle (◀)	74	\sqsubset (□)	42	\sslash (//)	25																																																																																																																																																																																																										
\SpinDown ()↓	89	\sqsubset (□)	41	\ssststile (   )	40																																																																																																																																																																																																										
\SpinUp ()↑	89	\sqsubset (□)	41																																																																																																																																																																																																												
\spirituslenis (՞)	65																																																																																																																																																																																																														

\sststile (▀)	40
\shttstile (▀▀)	40
\sswarro (/\)	48
\stackrel .....	23, 114, 118
standard state .....	115
\star (*) .....	24, 118
\star (*) .....	28
Star of David .....	87
\starredbullet (+) .....	88
stars .....	73, 87, 88
\stater (⌚) .....	21
statistical independence .....	116
\staveI (▀▀▀▀▀)	107
\staveII (⌚⌚⌚⌚⌚)	107
\staveIII (▀▀▀▀▀)	107
\staveIV (⌚⌚⌚⌚⌚)	107
\staveIX (▀▀▀▀▀)	107
\staveL (▀▀▀▀▀)	107, 108
\staveLI (⌚⌚⌚⌚⌚)	107
\staveLII (⌚⌚⌚⌚⌚)	107
\staveLIII (⌚⌚⌚⌚⌚)	107
\staveLIV (⌚⌚⌚⌚⌚)	107
\staveLIX (⌚⌚⌚⌚⌚)	108
\staveLV (⌚⌚⌚⌚⌚)	107
\staveLVI (⌚⌚⌚⌚⌚)	108
\staveLVII (⌚⌚⌚⌚⌚)	108
\staveLVIII (⌚⌚⌚⌚⌚)	108
\staveLX (⌚⌚⌚⌚⌚)	108
\staveLXI (⌚⌚⌚⌚⌚)	108
\staveLXII (⌚⌚⌚⌚⌚)	108
\staveLXIII (⌚⌚⌚⌚⌚)	108
\staveLXIV (⌚⌚⌚⌚⌚)	108
\staveLXV (⌚⌚⌚⌚⌚)	108
\staveLXVI (⌚⌚⌚⌚⌚)	108
\staveLXVII (⌚⌚⌚⌚⌚)	108
\staveLXVIII (⌚⌚⌚⌚⌚)	108
staves .....	107
staves (package) .....	107, 130
\staveV (⌚⌚⌚⌚⌚)	107
\staveVI (⌚⌚⌚⌚⌚)	107
\staveVII (⌚⌚⌚⌚⌚)	107
\staveVIII (⌚⌚⌚⌚⌚)	107
\staveX (⌚⌚⌚⌚⌚)	108
\staveXI (⌚⌚⌚⌚⌚)	108
\staveXII (⌚⌚⌚⌚⌚)	108
\staveXIII (⌚⌚⌚⌚⌚)	108
\staveXIV (⌚⌚⌚⌚⌚)	108
\staveXIX (⌚⌚⌚⌚⌚)	108
\staveXL (⌚⌚⌚⌚⌚)	108
\staveXLI (⌚⌚⌚⌚⌚)	108
\staveXLII (⌚⌚⌚⌚⌚)	108
\staveXLIII (⌚⌚⌚⌚⌚)	108
\staveXLIV (⌚⌚⌚⌚⌚)	108
\staveXLIX (⌚⌚⌚⌚⌚)	107
\staveXLV (⌚⌚⌚⌚⌚)	108
\staveXLVI (⌚⌚⌚⌚⌚)	108
\staveXLVII (⌚⌚⌚⌚⌚)	107
\staveXLVIII (⌚⌚⌚⌚⌚)	107
\staveXV (⌚⌚⌚⌚⌚)	108
\staveXVI (⌚⌚⌚⌚⌚)	108
\staveXVII (⌚⌚⌚⌚⌚)	108
\staveXVIII (⌚⌚⌚⌚⌚)	108
\staveXX (⌚⌚⌚⌚⌚)	108
\staveXXI (⌚⌚⌚⌚⌚)	108
\staveXXII (⌚⌚⌚⌚⌚)	108
\staveXXIII (⌚⌚⌚⌚⌚)	108
\staveXXIV (⌚⌚⌚⌚⌚)	107
\staveXXIX (⌚⌚⌚⌚⌚)	107
\staveXXV (⌚⌚⌚⌚⌚)	107
\staveXXVI (⌚⌚⌚⌚⌚)	107
\staveXXVII (⌚⌚⌚⌚⌚)	107
\staveXXVIII (⌚⌚⌚⌚⌚)	107
\staveXXX (⌚⌚⌚⌚⌚)	107
\staveXXXI (⌚⌚⌚⌚⌚)	107
\staveXXXII (⌚⌚⌚⌚⌚)	107
\staveXXXIII (⌚⌚⌚⌚⌚)	108
\staveXXXIV (⌚⌚⌚⌚⌚)	108
\staveXXXIX (⌚⌚⌚⌚⌚)	108
\staveXXXV (⌚⌚⌚⌚⌚)	108
\staveXXXVI (⌚⌚⌚⌚⌚)	108
\staveXXXVII (⌚⌚⌚⌚⌚)	108
\staveXXXVIII (⌚⌚⌚⌚⌚)	108
\stdtstile (▀▀)	39
\steaming (♨)	75
steinmetz (package) ..	79, 130, 132
Steinmetz phasor notation ..	79
sterling .....	<i>see \pounds</i>
stick figures .....	91
\Stigma ( $\Gamma$ ) .....	97
\stigma ( $\gamma$ ) .....	97
\stmaryrd (package) .....	25, 29, 34, 41, 46, 48, 55, 60, 62, 111, 115, 129, 130
stochastic independence .....	<i>see \bot</i>
\StoneMan ( $\blacktriangle$ ) .....	102
\Stopsign ( $\text{STOP}$ ) .....	82
\StopWatchEnd ( $\text{STOP}$ ) .....	102
\StopWatchStart ( $\text{STOP}$ ) .....	102
\stress (')	20
\strictfi ( $\varepsilon$ ) .....	35
\strictif ( $\exists$ ) .....	35
\strictiff ( $\exists\exists$ ) .....	35
\strokedint ( $f$ ) .....	33
\StrokeFive (     ) .....	102
\StrokeFour (    ) .....	102
\StrokeOne ( ) .....	102
\StrokeThree (   ) .....	102
\StrokeTwo (  ) .....	102
\stst ( $^*$ ) .....	115
\stststile (▀▀)	39
\sttstile (▀▀)	39
\stttstile (▀▀▀)	39
\STX (❶) .....	81
\SUB ( $\rightarrow$ ) .....	81
subatomic particles .....	83
\subcorner (▀)	18
\subdoublebar (▀)	18
\subdoublevert (▀)	18
\sublptr (▀)	18
\subrptr (▀)	18
subscripts .....	
new symbols used in .....	116
\Subset ( $\subseteq$ ) .....	42
\Subset ( $\subsetneq$ ) .....	41
\Subset ( $\subsetneqq$ ) .....	42
\subsetset ( $\subset$ ) .....	42
\subsetset ( $\subset$ ) .....	41
\subsetset ( $\subset$ ) .....	42
\subsetseteq ( $\subseteq$ ) .....	42
\subsetseteq ( $\subseteq$ ) .....	41

\subsetneq (⊆)	42	\Supset (⊇)	42	astrological	79
\subsetneqq (⊈)	42	\supset (⊃)	42	astronomical	79, 108
\subsetneqq (⊉)	41	\supset (⊃)	41	biological	82
\subsetneqq (⊊)	42	\supset (⊃)	42	block-element	107
\subsetneq (⊊)	42	\supseteq (⊇)	42	body-text	10–22
\subsetneq (⊋)	41	\supseteq (⊇)	41	bold	123–124
\subsetneq (⊋)	42	\supseteq (⊇)	42	box-drawing	107
\subsetneqq (⊋)	42	\supseteqq (⊇)	42	chess	104
\subsetneqq (⊌)	41	\supseteqq (⊇)	41	cipher	108
\subsetneqq (⊍)	42	\supseteqq (⊇)	42	clock	98, 100, 102
\subsetneq (⊎)	41	\supsetneq (⊋)	42	communication	82
\subsetneq (⊏)	41	\supsetneq (⊋)	42	computer hardware	80
\subsetneq (⊏)	41	\supsetneq (⊋)	41	contradiction	23, 55
\subsetneqq (⊑)	42	\supsetneq (⊋)	42	currency	20, 21, 76
\subsetneqq (⊒)	42	\supsetneq (⊋)	42	dangerous bend	99
\subsetneq (⊓)	41	\supsetneq (⊋)	41	definition	23, 118
\subsetneq (⊔)	41	\supsetneq (⊋)	42	dictionary	12–15, 106
\subsetneq (⊕)	41	\supsetplus (⊕)	41	dingbat	84–90
\subsetneq (⊖)	41	\supsetplus (⊕)	41	dot	10, 70–72, 117
subsets	41, 42	\surd (√)	73	electrical	78
\succ (≻)	34	\SurveySign (△)	102	engineering	78, 82
\succ (≻)	36	\Swarrow (↗)	49	extensible	54, 66–70, 79, 112, 118–119
\succapprox (≿)	36	\Swarrow (↖)	50	Feynman diagram	83
\succapprox (≿)	34	\swarrow (↙)	49	Frege logic	54, 60, 72, 75
\succapprox (≿)	36	\swarrow (↖)	47, 117	frown	55
\succcurlyeq (≿)	36	\swarrow (↙)	50	gates, digital logic	81
\succcurlyeq (≿)	34	\swarrowtail ( ↗)	50	genealogical	98
\succcurlyeq (≿)	37	\swfilledspoon (↗)	54	general	98
\succdot (▷)	36	\swfootline (↙)	37	Go stones	105
\succeq (≥)	34	\swfree (↙)	37	information	100
\succeq (≥)	37	\swharpoonccw (↙)	53	informer	104
\succnapprox (≿)	36	\swharpoonccw (↙)	53	inverted	12–15, 19, 113
\succnapprox (≿)	34	\swlsquigarrow ( ↗)	50	keyboard	80
\succnapprox (≿)	38	\swmapsto (↗)	50	Knuth's	99, 100
\succneq (≿)	36	\swModels (⤠)	37	laundry	100
\succneq (≿)	35	\swmodels (⤠)	37	legal	10, 21, 127
\succnapprox (≿)	36	\swnearrows ( ↗)	50	letter-like	59, 60
\succnapprox (≿)	34	\swneharpoons (⤠)	53	life insurance	118
\succnsim (≿)	37	swords	101	linear logic	23–25, 28, 29, 32–33, 40, 59
\succnsim (≿)	36	\swpitchfork (⤠)	54	linguistic	12–15
\succnsim (≿)	34	\swrsquigarrow ( ↗)	50	log-like	56, 123
\succnsim (≿)	38	\swspoon (↙)	54	logic	81
\succsim (≿)	36	\swwarrows ( ↗)	50	magical signs	107
\succsim (≿)	34	swung dash	see \sim	mathematical	23–77
\succsim (≿)	37	\swVdash (⤠)	37	METAFONTbook	100
such that	113, 115	\swvDash (⤠)	37	metrical	105, 106
\suchthat (⊰)	115	\syl (⠄)	18	miscellaneous	73–75, 90, 98–109
\sum (Σ)	29	\syllabic (⠄)	20	monetary	20, 21, 76
\sum (Σ)	33	\symA (Ⓐ)	76	musical	22, 73, 74, 98, 99
\sumint (ʃ)	33	\symAE (Ӕ)	77	navigation	100
\Summit (▲)	102	\symB (Ⓑ)	76	non-commutative division	70
\SummitSign (†)	102	\symbol{b}ishop (皇)	104	particle physics	83
\Sun (⊙)	79	Symbol (font)	58, 113	Phaistos disk	91
\Sun (⊖)	111	symbols		phonetic	12–15
\Sun (☀)	101	actuarial	118	physical	78
\Sun (⊖)	79	alpine	102	pitchfork	34, 54, 73
\sun (⊛)	98	ancient language	91–97		
\SunCloud (ঃ)	101	annuity	118		
\SunshineOpenCircled (ঃ)	90	APL	80		
\sup (sup)	56				
superscripts					
new symbols used in	116				
supersets	41, 42				
supremum	see \sup				
\Supset (⊇)	42				
\Supset (⊇)	41				

Pitman's base-12	72	\Tape (⌚)	90	\textasciitilde (~)	10, 125, 128
present value	118	\Taschenuhr (⌚)	102	\textasteriskcentered (*)	10, 22
proto-Semitic	91	Tate-Shafarevich group	<i>see sha</i>	\textbabymathbf{gamma} (\mathfrak{y})	12
pulse diagram	78	\tau ( $\tau$ )	57	\textbackslash (\textbackslash)	10, 125
recycling	109	\Tau ( $\Theta$ )	79	\textbar (B)	20
relational	34	\Tau ( $\Theta$ )	79	\textbar ( )	10, 124, 125
reversed	113	\taurus ( $\Theta$ )	79	\textbar (b)	12
rotated	12–15, 19, 113	tautology	<i>see \top</i>	\textbar (e)	12
safety-related	82	\tauauup ( $\tau$ )	57	\textbar (d)	12
scientific	78–83	\tccentigrade ( $^{\circ}\mathrm{C}$ )	72	\textbar (  )	22
Simpsons characters	106	\tcmu ( $\mu$ )	72	\textbar (f)	12
smile	55	\tcohm ( $\Omega$ )	72	\textbar (g)	12
spoon	54	\tcpertenthousand ( $\%_{\mathrm{o}}$ )	72	\textbar (?)	12
staves	107	\tcpertousand ( $\%_{\mathrm{o}}$ )	72	\textbar (i)	12
subset and superset	41, 42	\td (■)	18	\textbar (l)	12
technological	78–83	\tdt (■)	39	\textbar (o)	12
TeXbook	99, 100	\tdst (■)	39	\textbar (revglotstop) (?)	12
transliteration	15	\tdt (■)	39	\textbar (u)	12
upside-down	12–15, 19, 113, 124	\tdtt (■)	39	\textbel (‡)	12
variable-sized	29–33, 110, 112	technological symbols	78–83	\textbentail (ȝ)	13
weather	101	\Telefon (☎)	82	\textbeta (β)	12
zodiacal	79	\Telephone (☎)	102	\textbigcircle (○)	22
<b>symbols.tex</b> (file)	110, 130	\Telephone (✉)	109	\textbktailgamma (γ)	13
\symC (C)	76	\Terminus (⊗)	105	\textblank (b)	22
\symking (♔)	104	\terminus (⊗)	105	\textblock (█)	107
\symknight (♕)	104	\Terminus* (⊕)	105	\textborn (★)	98
\symOE (Œ)	77	\Terminus* (⊕)	105	\textbottomtiebar (▀)	16
\sympawn (♙)	104	\tesh (ȝ)	14	\textbraceleft ({})	10
\symqueen (♕)	104	testfont.dvi (file)	122	\textbraceright (})	10
\symrook (♖)	104	testfont.tex (file)	120, 122	\textbreve (˘)	16
\symUE (Ӯ)	77	\tetartemorion (ɔ)	21	\textbrokenbar ( )	22, 127
\SYN (¬)	81	teubner (package)	21, 72, 97, 106, 130, 131	\textbullet (•)	10, 22, 128
<b>T</b>		TeX	47, 54, 71, 79, 107, 110, 113–120, 122, 123, 125, 126, 129, 133	\textcelsius (°C)	78, 128
\T	11	TeXbook, The	113, 114, 116, 117, 119, 123	\textceltpal (՚)	12
\T (■)	19	symbols from	99, 100	\textcent (¢)	20, 127
\T (⊗)	105	\textacutedbl (”)	20	\textcentoldstyle (¢)	20
\t (■)	16	\textacute (ˊ)	16	\textchi ()	12
\t (⊗)	105	\textacuteewedge (ˇ)	16	\textcircled (○)	16
t4phonet (package)	15, 19, 130, 131	\textadvancing (➤)	16	\textcircledP (Ⓟ)	21
\Tab (◀▶)	80	\textao (ao)	13	\textcircumacute (˜)	16
\tabcolsep	114	\textasciacute (‘)	20, 127	\textcircumdot (՞)	16
tacks	34, 59	\textasciibreve (˜)	20	\textcloseepsilon (ε)	12
\taild (d̄)	14	\textasciicaron (ˇ)	20	\textcloseomega (ω)	12
\tailinvr (J̄)	14	\textasciicircum (ˆ)	10, 125, 128	\textclosevarepsilon (ȝ)	12
\taill (l̄)	14	\textasciidieresis (˝)	20, 127	\textcolonmonetary (₵)	20
\tailn (n̄)	14	\textasciigrave (˘)	20	\textcommatailz (ȝ)	12
\tailr (r̄)	14	\textasciimacron (—)	126	textcomp (package)	9, 10, 16, 20–22, 48, 65, 74, 78, 98, 110, 125, 126, 130
\tails (s̄)	14	\textasciimacron (—)	20, 127	\textcopyleft (⌚)	21
\tailt (t̄)	14	\textasciimacron (—)	20	\textcopyright (©)	10, 21, 127
\tailz (z̄)	14	\textasciimacron (—)	20	\textcorner (⌇)	12
\Takt	99	\textasciimacron (—)	20, 127	\textcrb (b)	12
\talloblong (□)	25	\textasciimacron (—)	126	\textcrd (d̄)	12
tally markers	95, 102, 103	\textasciimacron (—)	15	\textcrd (d̄)	15
\tan (tan)	56	\textasciimacron (—)	20, 127	\textcrg (g)	12
\tanh (tanh)	56				

\textcrh (h) . . . . .	12	\textellipsis (...) . . . . .	10	\texthtk (k) . . . . .	15
\textcrh (h̄) . . . . .	15	\textemdash (—) . . . . .	10	\texthtp (þ̄) . . . . .	12
\textcrinvglotstop (ð̄) . . . . .	12	\textendash (–) . . . . .	10	\texthtp (þ̄̄) . . . . .	15
\textcrlambda (λ̄) . . . . .	12	\textepsilon (ε̄) . . . . .	13	\texthtq (ð̄̄) . . . . .	12
\textcrtwo (ð̄̄) . . . . .	12	\textepsilon (ε̄̄) . . . . .	15	\texthttaild (ð̄̄) . . . . .	12
\textctc (c̄) . . . . .	12	\textesh (ʃ̄) . . . . .	13	\texthtscg (ð̄̄̄) . . . . .	12
\textctd (d̄) . . . . .	12	\textesh (ʃ̄̄) . . . . .	15	\texthtt (f̄) . . . . .	12
\textctdctzlig (ð̄̄̄) . . . . .	12	\textestimated (ð̄̄̄) . . . . .	22	\texthtt (f̄̄) . . . . .	15
\textctesh (ʃ̄) . . . . .	12	\texteuro (€̄) . . . . .	21	\texthvlig (lv̄) . . . . .	12
\textctinvglotstop (ð̄̄) . . . . .	13	\texteuro (€̄̄) . . . . .	20	\textifsym . . . . .	78
\textctj (j̄) . . . . .	12	\texteuro (€̄̄̄) . . . . .	20, 126, 128	\textinterrobang (?) . . . . .	22
\textctjvar (j̄) . . . . .	13	\textexclamdown (ð̄̄̄̄) . . . . .	10	\textinterrobangdown (ð̄̄̄̄) . . . . .	22
\textctn (n̄) . . . . .	12	\textfemale (♀̄) . . . . .	13	\textinvglotstop (ð̄̄̄̄̄) . . . . .	12
\textctstretchc (ð̄̄̄̄̄) . . . . .	13	\textfishhookr (r̄) . . . . .	13	\textinvomega (ω̄) . . . . .	13
\textctstretchcvar (c̄) . . . . .	13	\textfiveoldstyle (᳚̄) . . . . .	22	\textinvscsa (v̄) . . . . .	13
\textctt (t̄) . . . . .	12	\textfjlig (f̄̄) . . . . .	15	\textinvscr (v̄̄) . . . . .	12
\textcttctclig (tc̄) . . . . .	12	\textflorin (f̄̄̄) . . . . .	20	\textinvscripta (ɑ̄) . . . . .	13
\textctturnt (ȳ̄) . . . . .	13	\textfouroldstyle (᳚̄̄) . . . . .	22	\textinvsubbridge (ū̄) . . . . .	17
\textctyogh (ȝ̄) . . . . .	12	\textfractionsolidus (/̄) . . . . .	74	\textiota (ī) . . . . .	12
\textcttz (ȝ̄̄) . . . . .	13	\textfrak . . . . .	76	\textiota (ī̄) . . . . .	15
\textcurrency (ؔ̄) . . . . .	20, 127	\textfrbarn (n̄) . . . . .	13	\textlambda (λ̄) . . . . .	12
\textcypr . . . . .	96	\textfrhookd (d̄) . . . . .	13	\textlangl (⟨̄) . . . . .	65, 124
\textdagger (†̄) . . . . .	10, 22	\textfrhookdvar (d̄̄) . . . . .	13	\textlbrackdbl (〔̄) . . . . .	65
\textdaggerdbl (‡̄) . . . . .	10, 22	\textfrhookt (t̄) . . . . .	13	\textleaf (ð̄̄̄) . . . . .	98
	99	\textfrtailgamma (γ̄) . . . . .	13	\textleftarrow (←̄) . . . . .	48
\textdbend (܂̄) . . . . .	22	\textg (ḡ) . . . . .	13	\textlengthmark (:) . . . . .	12
\textdblhyphen (܂̄̄) . . . . .	22	\textgamma (γ̄) . . . . .	13	\textless (<̄) . . . . .	10, 124, 125
\textdblhyphenchar (܂̄̄̄) . . . . .	22	\textglobfall (݂̄) . . . . .	13	\textlfblock (܂̄̄̄̄) . . . . .	107
\textdbligh (ଦ̄) . . . . .	13	\textglobrise (݂̄̄) . . . . .	13	\textlfishhookrlig (ଫ̄) . . . . .	13
\textdctzlig (ଙ̄) . . . . .	13	\textglotstop (܂̄̄̄) . . . . .	12		99
\textdegree (°̄) . . . . .	74, 127	\textglotstopvari (܂̄̄̄̄) . . . . .	13	\textlhookfour (܂̄̄̄̄̄) . . . . .	13
\textdied (ତ̄) . . . . .	98	\textglotstopvari (܂̄̄̄̄̄̄) . . . . .	14	\textlhookp (ପ̄) . . . . .	13
\textdiscount (٪̄) . . . . .	22	\textglotstopvari (܂̄̄̄̄̄̄̄) . . . . .	14	\textlhookt (ତ̄̄) . . . . .	12
\textdiv (ବ̄) . . . . .	74	\textgoth . . . . .	76	\textlhti (ା̄) . . . . .	13
\textdivorced (ଓ̄) . . . . .	98	\textgravecircum (ମ̄) . . . . .	16	\textlhtlongi (ି̄) . . . . .	12
\textdkshade (܂̄̄̄) . . . . .	107	\textgravedbl (ମ̄̄) . . . . .	20	\textlhtlongy (ୟ̄) . . . . .	12
\textdnblock (܂̄̄̄̄) . . . . .	107	\textgravedot (ମ̄̄̄) . . . . .	16	\textlinb . . . . .	95, 96
\textdollar (\$) . . . . .	10, 20	\textgravemacron (ମ̄̄̄̄) . . . . .	16	\textlira (ଲ̄) . . . . .	20
\textdollaroldstyle (\$) . . . . .	20	\textgravemid (ମ̄̄̄̄̄) . . . . .	17	\textlnot (ନ̄) . . . . .	74, 127
\textdong (ଡ̄) . . . . .	20	\textgreater (>̄) . . . . .	10, 124, 125	\textlonglegr (ର̄) . . . . .	12
\textdotacute (܂̄̄̄̄̄) . . . . .	16	\textrgamma (ଗ̄) . . . . .	14	\textlooptoprevesh (ଲ̄) . . . . .	13
\textdotbreve (܂̄̄̄̄̄̄) . . . . .	16	\textguarani (ଗ̄̄) . . . . .	20	\textlowering (ନ̄̄) . . . . .	17
\textdoublebaresh (ଫ̄) . . . . .	13	\texthalflength (ର̄) . . . . .	12	\textlptr (ର̄̄) . . . . .	12
\textdoublebarpipe (ଫ̄) . . . . .	13	\texthardsign (ବ̄) . . . . .	12	\textlquill (କ̄) . . . . .	65
\textdoublebarpipevar (ଫ̄) . . . . .	13	\textheng (ହ̄) . . . . .	14	\textltailm (ମ̄) . . . . .	12
\textdoublebarslash (ଫ̄̄) . . . . .	13	\texthmlig (ହି) . . . . .	14	\textltailn (ନ̄) . . . . .	12
\textdoublegrave (ମ̄) . . . . .	16	\texthooktop (ର̄) . . . . .	12	\textltailn (ନ̄̄) . . . . .	15
\textdoublegrave (ମ̄̄) . . . . .	19	\texthtb (ବ̄) . . . . .	12	\textltilde (ତ̄) . . . . .	12
\textdoublepipe (ମ̄̄̄) . . . . .	13	\texthtb (ବ̄̄) . . . . .	15	\textltshade (ମ̄̄̄) . . . . .	107
\textdoublepipevar (ମ̄̄̄̄) . . . . .	13	\texthtbardotlessj (ଫ̄) . . . . .	12	\textlyoghlig (କ̄) . . . . .	12
\textdoublelevbaraccent (ମ̄̄̄̄̄) . . . . .	16	\texthtbardotlessjvar (ଫ̄̄) . . . . .	13	\textmarried (ଓ̄) . . . . .	98
\textdoublelevbaraccent (ମ̄̄̄̄̄̄) . . . . .	19	\texthtc (ଚ̄) . . . . .	12	\textmho (ୟ̄) . . . . .	78
\textdoublevertline (ମ̄̄̄̄̄̄̄) . . . . .	13	\texthtc (ଚ̄̄) . . . . .	15	\textmidacute (ଚ̄̄̄) . . . . .	17
\textdownarrow (ଜ̄) . . . . .	48	\texthtd (ଫ̄) . . . . .	12	\textminus (−̄) . . . . .	74
\textdownfullarrow (ଜ̄̄) . . . . .	13	\texthtd (ଫ̄̄) . . . . .	15	\textmu (ୟ̄) . . . . .	78, 127
\textdownstep (ଜ̄̄̄) . . . . .	13	\texthtg (ଫ̄̄̄) . . . . .	12	\textmusicalnote (ଜ̄) . . . . .	22
\textdyoghlig (ଫ̄̄̄̄) . . . . .	13	\texthtth (ଫି) . . . . .	12	\textnaira (ନ̄̄) . . . . .	20
\textdzlig (ଙ̄) . . . . .	13	\texthttheng (ଫି̄) . . . . .	12	\textnineoldstyle (୨̄) . . . . .	22
\texteightoldstyle (୮̄) . . . . .	22	\texthtk (କ̄) . . . . .	12		

\textnrleg (ñ) . . . . .	13	\textreferencemark (※) . . . . .	22, 23	\textscq (q) . . . . .	13
\textnumero (№) . . . . .	22	\textregistered (®) . . . . .	10, 21, 127	\textscr (r) . . . . .	12
\textbardotlessj (j) . . . . .	12	\textretracting (ゑ) . . . . .	17	\textscripta (a) . . . . .	12
\textbullseye (◎) . . . . .	13	\textretractingvar (ゑ) . . . . .	13	\textscriptg (g) . . . . .	12
\textohm (Ω) . . . . .	78	\textrevapostrophe (‘) . . . . .	13	\textscriptv (v) . . . . .	12
\textOlyoghlig (ԡ) . . . . .	12	\textreve (ܵ) . . . . .	13	\textscriptf (f) . . . . .	15
\textomega (ܮ) . . . . .	12	\textrevepsilon (ܳ) . . . . .	13, 113	\textscu (u) . . . . .	12
\textonehalf (߂) . . . . .	74, 127	\textreversedvideobend (ܶ) . . . . .	99	\textscy (y) . . . . .	12
\textoneoldstyle . . . . .	22	\textrevglotstop (ܴ) . . . . .	13	\textseagull (ܷ) . . . . .	17
\textoneoldstyle (ି) . . . . .	22	\textrevscl (ି) . . . . .	13	\textsecstress (ܸ) . . . . .	12
\textonequarter (߁) . . . . .	74, 127	\textrevscr (ି) . . . . .	13	\textsection (ܲ) . . . . .	10, 22
\textonesuperior (߁) . . . . .	74, 127	\textrevyogh (ܰ) . . . . .	13	\textservicemark (ܻ) . . . . .	21
\textopenbullet (ଓ) . . . . .	22	\textrhooea (ା) . . . . .	14	\textsevenoldstyle (߇) . . . . .	22
\textopencorner (߁) . . . . .	12	\textrhooke (ି) . . . . .	14	\textSFi (ܫ) . . . . .	107
\textopeno (ଓ) . . . . .	12	\textrhooepsilon (ୟ) . . . . .	14	\textSFii (ܪ) . . . . .	107
\textopeno (ଓ) . . . . .	15	\textrhookopeno (୧) . . . . .	14	\textSFiii (ܬ) . . . . .	107
\textordfeminine (܃) . . . . .	10, 22, 127	\textrhookrevespsilon (ܰ) . . . . .	13	\textSFiv (ܭ) . . . . .	107
\textordmasculine (܅) . . . . .	10, 22, 127	\textrhookschwa (ܰ) . . . . .	13	\textSFix (ܯ) . . . . .	107
\textovercross (ܶ) . . . . .	17	\textrhoticity (ܰ) . . . . .	13	\textSFli (܏) . . . . .	107
\textoverw (ܶ) . . . . .	17	\textrightarrow (→) . . . . .	48	\textSFlii (܏) . . . . .	107
\textpalhook (ܰ) . . . . .	12	\textringmacron (ܶ) . . . . .	17	\textSFlii (܏) . . . . .	107
\textpalhooklong (ܰ) . . . . .	13	\textroundcap (ܶ) . . . . .	17	\textSFiv (܏) . . . . .	107
\textpalhookvar (ܰ) . . . . .	13	\textrptr (ܰ) . . . . .	13	\textSFvi (܏) . . . . .	107
\textparagraph (ܺ) . . . . .	10, 22	\textrquill (ܰ) . . . . .	65	\textSFvii (܏) . . . . .	107
\textperiodcentered (ܰ) . . . . .	10, 22, 127	\textrtaild (ି) . . . . .	13	\textSFviii (܏) . . . . .	107
\textpertenthousand (ܰܰܰ) . . . . .	22	\textrtaild (ି) . . . . .	15	\textSFx (܏) . . . . .	107
\textperthousand (ܰܰ) . . . . .	22, 128	\textrtailh (ି) . . . . .	14	\textSFxi (܏) . . . . .	107
\textpeso (ܺ) . . . . .	20	\textrtaill (ି) . . . . .	13	\textSFxix (܏) . . . . .	107
\textphi (ܲ) . . . . .	13	\textrtailn (ି) . . . . .	12	\textSFxl (܏) . . . . .	107
\textpilcrow (ܺ) . . . . .	22	\textrtailr (ି) . . . . .	12	\textSFxli (܏) . . . . .	107
\textpipe (ܰ) . . . . .	13	\textrtails (ି) . . . . .	12	\textSFxlii (܏) . . . . .	107
\textpipe (ܰ) . . . . .	15	\textrtailt (ି) . . . . .	12	\textSFxlii (܏) . . . . .	107
\textpipevar (ܰ) . . . . .	13	\textrtailt (ି) . . . . .	15	\textSFxlii (܏) . . . . .	107
\textpm (ܰܰ) . . . . .	74, 127	\textrtailz (ି) . . . . .	12	\textSFxlii (܏) . . . . .	107
\textpmhg . . . . .	92	\textrtblock (ܶ) . . . . .	107	\textSFxlv (܏) . . . . .	107
\textpolhook (ܰ) . . . . .	17	\textrthook (ܰ) . . . . .	12	\textSFxlv (܏) . . . . .	107
\textprimstress (ܰ) . . . . .	13	\textrthooklong (ܰ) . . . . .	13	\textSFxlvii (܏) . . . . .	107
\textproto . . . . .	91	\texttsarab . . . . .	97	\textSFxlvii (܏) . . . . .	107
\textqplig (ܰ) . . . . .	13	\texttsca (ା) . . . . .	12	\textSFxx (܏) . . . . .	107
\textquestiondown (ܰ) . . . . .	10	\texttscaolig (ܰ) . . . . .	13	\textSFxxi (܏) . . . . .	107
\textquotedbl (") . . . . .	11, 124	\texttscb (ି) . . . . .	12	\textSFxxi (܏) . . . . .	107
\textquotedblleft (") . . . . .	10	\texttscdelta (ି) . . . . .	13	\textSFxxii (܏) . . . . .	107
\textquotedblright (") . . . . .	10	\texttsce (ି) . . . . .	12	\textSFxxiv (܏) . . . . .	107
\textquotefirst (ܰ) . . . . .	10	\texttscf (ି) . . . . .	13	\textSFxxxv (܏) . . . . .	107
\textquoteright (ܰ) . . . . .	10	\texttscg (ି) . . . . .	12	\textSFxxxvi (܏) . . . . .	107
\textquotesingle (ܰ) . . . . .	22, 124	\texttsch (ି) . . . . .	12	\textSFxxxvii (܏) . . . . .	107
\textquotestraightbase (ܰ) . . . . .	22	\texttschwa (ܰ) . . . . .	12	\textSFxxxvii (܏) . . . . .	107
\textquotestraightdblbase (ܰ) . . . . .	22	\texttschwa (ି) . . . . .	15	\textSFxxxix (܏) . . . . .	107
\textrectangle (ܰ) . . . . .	13	\texttsci (ି) . . . . .	12	\textSFxxxvi (܏) . . . . .	107
\textraiseglotstop (ܰ) . . . . .	13	\texttscj (ି) . . . . .	12	\textSFxxxvii (܏) . . . . .	107
\textraisevibyi (ܰ) . . . . .	13	\texttsck (ି) . . . . .	13	\textSFxxxviii (܏) . . . . .	107
\textraising (ܰ) . . . . .	17	\texttscl (ି) . . . . .	12	\textshade (ܶ) . . . . .	107
\textramshorns (ܰ) . . . . .	13	\texttscm (ି) . . . . .	13	\textsixoldstyle (ܶ) . . . . .	22
\textrangle (ܰ) . . . . .	65, 124	\texttscn (ି) . . . . .	12	\textsoftsign (ܰ) . . . . .	12
\textrbrackdbl (ܶ) . . . . .	65	\texttscoelig (ܰ) . . . . .	12	\textpleftarrow (ܰ) . . . . .	13
\textrecipe (ܺ) . . . . .	22, 112	\texttscomega (ܮ) . . . . .	12	\textsterling (ܰ) . . . . .	10, 20
\textrectangle (ܰ) . . . . .	13	\textscp (ܰ) . . . . .	13	\textstretchc (ܰ) . . . . .	12

\textstretchcvar (c)	13	\textturnscripta (v)	13	thousandths	see \textperthousand
\textstyle	116, 123	\textturnscu (n)	13	\threesim ( $\approx$ )	114
\textsubacute ()	17	\textturnt ()	13	tick	see check marks
\textsubarch ()	17	\textturnthree ()	14	tilde	10, 12, 14, 16–17, 20, 22, 65, 66, 68, 118, 125
\textsubbar ()	17	\textturntwo ()	14	extensible	66, 68
\textsubbridge ()	17	\textturnv ()	13	vertically centered	125
\textsubcircum ()	17	\textturnw ()	13	\tilde ()	65, 118
\textsubdot ()	17	\textturny ()	13	\tilde (t)	14
\textsubdoublearrow ()	13	\texttwelveudash (–)	22	time of day	102
\textsubgrave ()	17	\texttwooldstyle	22	\timelimit (⊕)	104
\textsubhalfring ()	17	\texttwooldstyle (2)	22	\times (x)	24
\textsubplus ()	17	\texttwosuperior ()	74, 127	\times (x)	26
\textsubrhalfring ()	17	\textuncrfemale ()	14	Times Roman (font)	20, 112
\textsubrightarrow ()	13	\textunderscore ()	10	timing (package)	78
\textsubring ()	17	\textuparrowarrow (↑)	48	tipa (package)	12, 13, 15–17, 19, 113, 130, 131
\textsubsquare ()	17	\textupblock (█)	107	tipx (package)	13, 130, 131
\textsubtilde ()	17	\textupfullarrow (↑)	14	\tn dtstile (   )	39
\textsubumlaut ()	17	\textupsilon (υ)	13	\tn ststile (   )	39
\textsubw ()	17	\textupstep (↑)	13	\tn tstile (   )	39
\textsubwedge ()	17	\textvbaraccent ()	17	\tn ttstile (   )	39
\textsuperimposetilde ()	17	\textvbaraccent ()	19	\to	see \rightarrow
\textsuperscript	18	\textvertline ( )	13	\ToBottom (▀)	100
\textsurd (✓)	74	\textvibyi ()	13	\tone	13
\textswab	76	\textvibyy ()	13	\top (T)	24, 59, 116
\textsyllabic ()	17	\textvisibleinspace ()	10	\top (T)	59
\texttctclig (tc)	12	\textwon (W)	20	\topbot (I)	116, 117
\textteshlig (f̄)	12	\textwynn (p)	13	\topdoteq (≈)	36
\textteshlig (f̄)	15	\textxswdown (☒)	101	torus (T) ... see alphabets, math	
\texttheta (θ)	12	\textxswup (☒)	101	\ToTop (▲) ... see trademark	100
\textthing (Ȣ)	101	\textyen (¥)	20, 127	trademark ... see \texttrademark	
\textthorn (þ)	12	\textyogh (ȝ)	13	\TransformHoriz (○—●)	40
\textthornvari (þ)	13	\textyogh (ȝ)	15	transforms	40, 70
\textthornvari (þ)	13	\textzerooldstyle (o)	22	\TransformVert (○)	40
\textthornvari (þ)	13	\TH (Þ)	11, 127	transliteration	
\textthornvariv (þ)	13	\th (þ)	11, 127	semitic	15, 19
\textthreeoldstyle (3)	22	Thành, Hàn Thé	118	transliteration symbols	15
\textthreequarters (¾)	74, 127	\therefore (∴)	36	transpose	24
\textthreequartersemdash (—)	22	\therefore (∴)	34, 71	transversal intersection	see \pitchfork
\textthreesuperior (³)	74, 127	\theremo	101	trema ()	see accents
\texttildedot ()	17	\Theta (Θ)	57	\trfsigns (package)	40, 59, 70, 130
\texttildelow (~)	22, 125	\theta (θ)	57	\triangle (△)	73
\texttimes (×)	74	\thetaup (θ)	57	\triangle (△)	47
\texttoneletterstem (l)	12	\thething (Ȣ)	101	triangle relations	46, 47
\texttoptiebar ()	17	\thickapprox (≈)	34	\TriangleDown (▽)	89
\texttrademark (™)	10, 21, 128	\thicksim (~)	34	\TriangleDown (▼ vs. ▽)	111
\texttslig (ts)	12	\thickvert ( )	62	\TriangleDown (▼)	89
\textturna (v)	12	thin space	123	\triangledown (▽)	73
\textturncelig (œ)	12	\ThinFog (    )	101	\triangledown (▽)	47
\textturnglotstop (l)	13	\thinstar (★)	28	\triangleeq (△)	47
\textturnh (u)	12	\third (☰)	73	\TriangleLeft (◀)	89
\textturnk (k)	12	thirty-second note ... see musical		\triangleleft (◁)	46
\textturnlongegr (I)	12	symbols		\triangleleft (▷)	24
\textturnnm (ui)	13	\Thorn (Þ)	14	\triangleleft (◁)	47
\textturnmrleg (w)	13	\thorn (þ)	14		
\textturnnr (i)	13	\thorn (þ)	15		
\textturnrrtail (l)	13	\thorn (þ)	14		
\textturnsck (s)	13				

\trianglelefteq ( $\leqslant$ ) . . . . .	46	\txfonts (package) . . . . .	23–25, 31, 34, 35,
\trianglelefteq ( $\trianglelefteq$ ) . . . . .	46	41, 43, 47, 49, 55, 57–59, 73,	
\trianglelefteq ( $\trianglelefteq$ ) . . . . .	47	76, 110, 112, 125, 130, 131	
\trianglelefteqslant ( $\trianglelefteqslant$ ) . . . . .	46	type1cm (package) . . . . .	110
\triangleq ( $\triangleq$ ) . . . . .	23, 46	Type 1 (font) . . . . .	122, 123
\triangleq ( $\triangleq$ ) . . . . .	47		
\TriangleRight ( $\triangleright$ ) . . . . .	89	<b>U</b>	
\triangleright ( $\triangleright$ ) . . . . .	46	\U (✉) . . . . .	19
\triangleright ( $\triangleright$ ) . . . . .	24	\U (✉) . . . . .	16
\triangleright ( $\triangleright$ ) . . . . .	47	\u (✉) . . . . .	16
\trianglerighteq ( $\trianglerighteq$ ) . . . . .	46	\UArrow (✉) . . . . .	80
\trianglerighteq ( $\trianglerighteq$ ) . . . . .	46	\UB (↗) . . . . .	99
\trianglerighteq ( $\trianglerighteq$ ) . . . . .	46	\ubar (✉) . . . . .	15
\trianglerighteq ( $\trianglerighteq$ ) . . . . .	45, 47	\ubarbbrevis (✉) . . . . .	106
\trianglerighteqslant ( $\trianglerighteqslant$ ) . . . . .	46	\ubarbrevis (✉) . . . . .	106
triangles . . . . .	73, 81, 89–90, 105	\ubarsbrevis (✉) . . . . .	106
\TriangleUp ( $\triangleup$ ) . . . . .	89	\ubrevislonga (✉) . . . . .	106
\TriangleUp ( $\blacktriangle$ vs. $\triangle$ ) . . . . .	111	ubulg.fd (file) . . . . .	122
\TriangleUp ( $\blacktriangle$ ) . . . . .	89	ucs (package) . . . . .	128
\triple . . . . .	64	\udesc (✉) . . . . .	15
\triplefrown (✉) . . . . .	55	\udot (•) . . . . .	26
\triplesim (✉) . . . . .	37	\udotdot (••) . . . . .	26, 71
\triplesmile (✉) . . . . .	55	\udots (•••) . . . . .	71
trsym (package) . . . . .	40, 130, 131	\udtimes (⊗) . . . . .	27
\tsbm (✉) . . . . .	105	\UHORN (✉) . . . . .	11
\tsdtstile (✉) . . . . .	39	\uhorn (✉) . . . . .	11
\tsmb (✉) . . . . .	105	\ulcorner (⌜) . . . . .	60
\tsmm (✉) . . . . .	105	\ulcorner (⌞) . . . . .	60
\tsststile (✉) . . . . .	39	\ulcorner (⌞) . . . . .	62
\Tsteel ( $\text{T}$ ) . . . . .	82	\ullcorner (⌞) . . . . .	63
\tststile (✉) . . . . .	40	\ulrcorner (⌞) . . . . .	63
\tststile (✉) . . . . .	40	ulsy (package) . . . . .	27, 55, 113, 130
\ttdtstile (✉) . . . . .	40	\Umd (✉) . . . . .	99
\TTsteel ( $\text{I}$ ) . . . . .	82	umlaut (✉) . . . . .	see accents
\ttststile (✉) . . . . .	40	unary operators . . . . .	23
\tttstile (✉) . . . . .	40	\unclear (∞) . . . . .	104
\ttttstile (✉) . . . . .	40	\underaccent . . . . .	118
TUGboat . . . . .	66	\underarc (✉) . . . . .	19
\Tumbler (✉) . . . . .	100	\underarch (✉) . . . . .	18
turnstile (package) . . . . .	39, 40, 130, 131	\underbrace (✉) . . . . .	67
\TwelveStar (★) . . . . .	87	\underbrace (✉) . . . . .	67
twiddle . . . . .	see tilde	\underbrace (✉) . . . . .	67
\twoheaddownarrow (↓) . . . . .	50	\underbrace (✉) . . . . .	66
\twoheadleftarrow (←) . . . . .	48	\underbracket (✉) . . . . .	67
\twoheadleftarrow (←) . . . . .	50	\underbracket (✉) . . . . .	118, 119
\twoheadnearrow (↗) . . . . .	50	\underdots („) . . . . .	20
\twoheadnarrow (↖) . . . . .	50	\undergroup (✉) . . . . .	67
\twoheadrightarrow (→) . . . . .	48	\undergroup (✉) . . . . .	67
\twoheadrightarrow (→) . . . . .	50	\underleftarrow (✉) . . . . .	67
\twoheadsearrow (↘) . . . . .	50	\underleftarrow (✉) . . . . .	67
\twoheadswarrow (↙) . . . . .	50	\underleftarrow (✉) . . . . .	67
\twoheaduparrow (↑) . . . . .	50	\underleftharp (✉) . . . . .	54
\twonotes (♪) . . . . .	98	\underleftharpdown (✉) . . . . .	54

\upfootline (↑)	37	\upuparrows (↑↑)	51	\varg (g)	15
\upfree (↑)	37	\upupharpoons (↑↑)	49	\vargeq (≥)	44
\UpsilonGamma (Γ)	58	\Upupsilon (Y)	58	\varhash (#)	73
\upgamma (γ)	58	\upupsilon (υ)	58	\varheart (♥)	75
upgreek (package)	58, 130, 131	\upvarepsilon (ε)	58	\varheartsuit (♥)	73
\upharpoonccw (↑)	53	\upvarphi (φ)	58	\varhexagon (○)	88
\upharpooncw (↑)	53	\upvarpi (ϖ)	58	\varhexstar (*)	87
\upharpoonleft (↓)	49	\upvarrho (ρ)	58	\vari (ι)	15
\upharpoonleft (↓)	48	\upvarsigma (σ)	58	variable-sized symbols	29–33, 110,
\upharpoonright (↓)	49	\upvartheta (ϑ)	58	112	
\upharpoonright (↓)	48	\upVdash (⊥)	37	\VarIceMountain (◣)	102
\upiota (ι)	58	\upvdash (⊥)	37	\varinjlim (lim)	56
\upkappa (κ)	58	\Upxi (Ξ)	58	\varint (ʃ)	29
\Uplambda (Λ)	58	\upxi (ξ)	58	\various (R)	104
\uplambda (λ)	58	\upY (ȝ)	26	\varkappa (ϰ)	57
\uplett	18	\upzeta (ζ)	58	\varleq (≤)	44
\uplsquigarrow (⤠)	51	\Uranus (δ)	79	\varliminf (lim)	56
\uplus (⊕)	26	\Uranus (��)	79	\varlimsup (lim)	56
\uplus (⊕)	24	\uranus (δ)	79	\varmathbb	76
\uplus (⊕)	27	\urcorner (⊸)	60	\VarMountain (▲)	102
\upmapsto (↑)	51	\urcorner (⊹)	60	\varnothing (∅)	23, 73
\upModels (⤒)	37	\urcorner (⊺)	62	\varnothing (∅)	74
\upmodels (⤒)	37	url (package)	125	\varnotin (∉)	59
\upmu (μ)	58	\US (▼)	81	\varnotowner (≠)	59
\upnu (ν)	58	\usepackage	9	\varoast (⊗)	25
\Upomega (Ω)	58	ushort (package)	68, 130, 132	\varobar (◑)	25
\upomega (ω)	58	\ushort (█)	68	\varobslash (◎)	25
\upp (^)	20	\ushortdw (█)	68	\varocircle (◎)	25
\upparenthfill	119	\ushortw (█)	68	\varodot (⊙)	25
\Upphi (Φ)	58	\ut (█)	18	\varogreaterthan (⊗)	25
\upphi (ϕ)	58	UTF-8	128, 129	\varoiintclockwise (fff)	31
\Uppi (Π)	58	utf8x (inputenc package option)	128	\varoiintctrcclockwise (fff)	31
\uppi (π)	58	\utilde (█)	68	\varoiint (ff)	32
\uppitchfork (♪)	54	\utimes (⊗)	27	\varoiintclockwise (ff)	31
\upproto (⊗)	37	\utimes (⊗)	26	\varoiintctrcclockwise (ff)	31
\Uppsi (Ψ)	58	Utopia (font)	20, 33	\varoint (∮)	29
\uppsi (ψ)	58			\varointclockwise (∮)	31
upquote (package)	125			\varointclockwise (∮)	32
\uprho (ρ)	58			\varointctrcclockwise (∮)	31
upright Greek letters	57, 58			\varointctrcclockwise (∮)	32
\uprsquigarrow (⤠)	51			\varolesthan (⊗)	25
upside-down symbols	124			\varomega (ω)	15
upside-down symbols	12–15, 19, 113			\varominus (⊖)	25
\Upsigma (Σ)	58			\varopeno (○)	15
\upsigma (σ)	58			\varplus (⊕)	25
\Upsilon (Υ)	57			\varslash (Ø)	25
\upsilon (υ)	57			\varotimes (⊗)	25
\upsilonup (υ)	57			\varovee (⊗)	25
\upslice (Δ)	28			\varowedge (⊗)	25
\upspoon (东方财富)	54			\varparallel (//)	35
\upt (⊥)	20			\varparallelinv (\\)	35
\uptau (τ)	58			\varpartialdiff (∂)	60
\uptherefore (∴)	26, 71			\varphi (φ)	57
\Upteta (Θ)	58			\varphiup (φ)	57
\uptheta (θ)	58			\varpi (ϖ)	57
\uptdownarrow (⤓)	49			\varpi (ω)	58
\upuparrows (↑↑)	49			\varpiup (ϖ)	57
\upuparrows (↑↑)	48				

\varprod ( $\times$ ) . . . . .	31	\Vdash (  -) . . . . .	37	\WashSynthetics ()	100
\varprojlim ( $\overleftarrow{\lim}$ ) . . . . .	56	\vDash ( =) . . . . .	36	\WashWool ()	100
\varpropto ( $\propto$ ) . . . . .	34	\vDash ( =) . . . . .	34	\wasylozenge ( $\bowtie$ ) . . . . .	98
\varpropto ( $\propto$ ) . . . . .	37	\vDash ( =) . . . . .	37	\wasypyropto ( $\propto$ ) . . . . .	35
\varQ ( $\mathbb{Q}$ ) . . . . .	101	\vdash ( -) . . . . .	34	\wasysym (package) . . . . .	14, 20, 22, 24, 25, 29, 34, 35, 41, 43, 47, 71, 73, 78, 80, 82, 86, 88, 98, 111, 130
\varrho ( $\varrho$ ) . . . . .	57	\vdash ( -) . . . . .	37	\wasytherefore (.:.) . . . . .	71
\varrho ( $\varrho$ ) . . . . .	58	\vdotdot (:)	26, 71	wavy-line delimiters . . . . .	62, 63
\varrhoup ( $\varrho$ ) . . . . .	57	\vdots (:)	70	\wbetter ( $\pm$ ) . . . . .	104
\varsigma ( $\varsigma$ ) . . . . .	57	\vdots (:)	71	\wdecisive (+-) . . . . .	104
\varsigmaup ( $\varsigma$ ) . . . . .	57	\vec ( $\vec{v}$ ) . . . . .	65	\weakpt ( $\times$ ) . . . . .	104
\varspade ( $\spadesuit$ ) . . . . .	75	\vec ( $\vec{v}$ ) . . . . .	65	\WeakRain ( $\cdots\cdots$ ) . . . . .	101
\varspadesuit ( $\spadesuit$ ) . . . . .	73	\Vectorarrow ( >) . . . . .	74	\WeakRainCloud () . . . . .	101
\varsqsubsetneq ( $\not\sqsubset$ ) . . . . .	42	\Vectorarrowhigh ( >) . . . . .	74	weather symbols . . . . .	101
\varsqsubsetneqq ( $\not\sqsubset$ ) . . . . .	42	\vee (v) . . . . .	26	\Wecker ()	102
\varsqsupsetneq ( $\not\sqsupset$ ) . . . . .	42	\vee (v) . . . . .	24	\wedge ( $\wedge$ ) . . . . .	26
\varsqsupsetneqq ( $\not\sqsupset$ ) . . . . .	42	\vee (v) . . . . .	26	\wedge ( $\wedge$ ) . . . . .	24
\varstar (*) . . . . .	26	\veebar ( $\vee\!\!\!\backslash$ ) . . . . .	26	\wedge ( $\wedge$ ) . . . . .	27
\varstigma ( $\mathfrak{s}$ ) . . . . .	97	\veebar ( $\vee\!\!\!\backslash$ ) . . . . .	24	\wedgedot ( $\wedge\!\!\!\cdot$ ) . . . . .	27
\varsubsetneq ( $\not\subseteq$ ) . . . . .	42	\veedot (v) . . . . .	27	Weierstrass $\wp$ function . . . . . see \wp	
\varsubsetneq ( $\not\subseteq$ ) . . . . .	41	\veedoublebar ( $\not\equiv$ ) . . . . .	26	\wfermion ( $\wedge$ ) . . . . .	83
\varsubsetneq ( $\not\subseteq$ ) . . . . .	42	\Venus (♀) . . . . .	79	\Wheelchair () . . . . .	100
\varsubsetneqq ( $\not\subseteq$ ) . . . . .	42	\Venus (♀) . . . . .	79	\whermion ( $=$ ) . . . . .	83
\varsubsetneqq ( $\not\subseteq$ ) . . . . .	41	\venus (♀) . . . . .	79	\whistle ( $\square$ ) . . . . .	18
\varsubsetneqq ( $\not\subseteq$ ) . . . . .	42	\vernal (↑) . . . . .	79		
\VarSummit ( $\triangle$ ) . . . . .	102	versicle (Ψ) . . . . .	129		
\varsupsetneq ( $\not\supseteq$ ) . . . . .	42	\VERT (   ) . . . . .	64	\WhiteBishopOnBlack () . . . . .	104
\varsupsetneq ( $\not\supseteq$ ) . . . . .	41	\Vert (  ) . . . . .	61, 63	\WhiteBishopOnWhite () . . . . .	104
\varsupsetneq ( $\not\supseteq$ ) . . . . .	42	\vert () . . . . .	61, 63	\WhiteEmptySquare ( ) . . . . .	104
\varsupsetneqq ( $\not\supseteq$ ) . . . . .	42	\vertbowtie (x) . . . . .	27	\WhiteKingOnBlack () . . . . .	104
\varsupsetneqq ( $\not\supseteq$ ) . . . . .	41	\vertdiv (..) . . . . .	27	\WhiteKingOnWhite () . . . . .	104
\varsupsetneqq ( $\not\supseteq$ ) . . . . .	42	\VHF (≈) . . . . .	78	\WhiteKnightOnBlack () . . . . .	104
\VarTaschenuhr () . . . . .	102	\Vier (♦) . . . . .	99	\WhiteKnightOnWhite () . . . . .	104
\vartheta ( $\vartheta$ ) . . . . .	57	vietnam (package) . . . . .	130	\WhitePawnOnBlack () . . . . .	104
\varthetaup ( $\vartheta$ ) . . . . .	57	\Village (⌂⌂) . . . . .	102	\WhitePawnOnWhite () . . . . .	104
\vartimes ( $\times$ ) . . . . .	25	\vin (˩) . . . . .	60	\WhiteQueenOnBlack () . . . . .	104
\vartriangle ( $\Delta$ ) . . . . .	73	vinculum . . . . . see \overline		\WhiteQueenOnWhite () . . . . .	104
\vartriangle ( $\Delta$ ) . . . . .	47	\ViPa (♪) . . . . .	99	\WhiteRookOnBlack () . . . . .	104
\vartriangleright ( $\rightarrow$ ) . . . . .	46	\Virgo (♍) . . . . .	79	\WhiteRookOnWhite () . . . . .	104
\vartriangleright ( $\rightarrow$ ) . . . . .	46	\virgo (♍) . . . . .	79		
\vartriangleright ( $\rightarrow$ ) . . . . .	45	\VM (>) . . . . .	99		
\vartriangleright ( $\rightarrow$ ) . . . . .	47	\vntex (package) . . . . .	11, 16		
\vartriangleright ( $\rightarrow$ ) . . . . .	45	\vod (v) . . . . .	15		
\vartriangleright ( $\rightarrow$ ) . . . . .	47	\voicedh (fi) . . . . .	15		
\varv ( $v$ ) . . . . .	58	\vppm (i) . . . . .	105		
\varvarpi ( $\varpi$ ) . . . . .	58	\vpppm (i) . . . . .	105		
\varvarrho ( $\varrho$ ) . . . . .	58	\vrule . . . . .	107		
\varw ( $w$ ) . . . . .	58	\VT (σ) . . . . .	81		
\vary ( $y$ ) . . . . .	58	\vv (▀) . . . . .	68		
\VBar ( ) . . . . .	89	\VvDash (  =) . . . . .	35		
\vbipropto (8) . . . . .	26	\Vvdash (  -) . . . . .	36		
\vcentcolon (:)	39	\Vvdash (  -) . . . . .	36		
\vcenter . . . . .	114	\Vvdash (  -) . . . . .	34		
\vcrossing (x) . . . . .	37	\Vvdash (  -) . . . . .	37		
\VDash (  =) . . . . .	36	\vvvert (   ) . . . . .	62		
\VDash (  =) . . . . .	37				
\Vdash (  -) . . . . .	36				
\Vdash (  -) . . . . .	37				
\Vdash (  -) . . . . .	36				
\Vdash (  -) . . . . .	34	\WashCotton () . . . . .	100		

\widecheck (⌚)	67
\widehat (🎩)	67
\widehat (🎩)	66
\wideOarc (taboola)	68
\wideparen (⏜)	67
\wideparen (⏜)	68
\wideparen (⏜)	67
\wideparen (⏜)	66
\widering (߁)	67
\widering (߁)	68
\widering (߁)	66
\widetilde (߂)	67
\widetilde (߂)	66
\widetilde (߂)	68
\widetriangle (߃)	66
\wind	101
window	101
Windows®	126
\with (&)	27
\with (└)	104
\withattack (→)	104
\withidea (△)	104
\withinit (↑)	104
\without (⊓)	104
\wn (?)	23
woman	91, 101
\Womanface (߁)	101
won	see \textwon
world	101
\wp (℘)	59
\wp (℘)	59
\wr (⌚)	24
\wr (⌚)	27
\wreath (⌚)	27
wreath product	see \wr
\Writinghand (✍)	100
wsipa (package)	14, 18, 20, 111, 113, 118, 130, 131
\upperhand (±)	104
<b>X</b>	
\x (܂)	72
\x (:)	105
\XBox (܂)	86
Xdvi	54, 113
X <sub>ETEX</sub>	129
xfrac (package)	74
\xhookleftarrow (hook)	69
\xhookrightarrow (hook)	69
\Xi (Ξ)	57
\xi (ξ)	57
\xiup (ξ)	57
\xLeftarrow (Left)	69
\xleftarrow (Left)	68
\xleftharpoondown (leftharpoon down)	69
\xleftharpoonup (leftharpoon up)	69
\xLeftrightarrow (Leftright)	69
\xLeftrightarrow (Leftright)	69
\xLeftrightarrow (Leftright)	69
\xleftrightharpoons (leftrightharpoons)	69
\xlongequal (longequal)	70
\xlongequal (longequal)	69
\xLongleftarrow (Longleft)	69
\xLongleftarrow (Longleft)	69
\xLongleftrightarrow (Longleftrightarrow)	69
\xlongleftarrow (longleft)	69
\xlongleftarrow (longleft)	69
\xlongrightarrow (longright)	69
\xmapsto (mapsto)	69
\xmapsto (mapsto)	70
XML	126
\xrightarrow (Right)	69
\xrightarrow (Right)	68
\xrightarpoondown (rightarpoon down)	69
\xrightarpoonup (rightarpoon up)	69
\xrightleftharpoons (rightleftharpoons)	69
\xrightleftharpoons (rightleftharpoons)	69
\xsolid (solid)	86
\XSolidBold (SolidBold)	86
\XSolidBrush (SolidBrush)	86
\xswordsdown (wordsdown)	101
\xswordsup (wordsup)	101
\xtwoheadleftarrow (twoheadleft)	70
\xtwoheadrightarrow (twoheadright)	70
X <sub>pic</sub>	117
<b>Y</b>	
\Ydown (߂)	25
yen	see \textyen
yfonts (package)	76, 77, 130, 131
yhmath (package)	66, 68, 71, 117, 130
\Yinyang (߂)	101
\Yleft (left)	25
\yogh (ȝ)	14
\yogh (ȝ)	15
\Yright (right)	25
Yu, Billy	118
\Yup (ȝ)	25
<b>Z</b>	
Zapf Chancery (font)	76
Zapf Dingbats (font)	84, 87
\Zborder (border)	90
\zeta (ζ)	57
\zetaup (ζ)	57
\Zodiac	79
zodiacal symbols	79
\Ztransf (Ztransf)	40
\ztransf (ztransf)	40
\zugzwang (zugzwang)	104
\Zwdr (Zwdr)	99
\ZwPa (ZwPa)	99