

Date: 1 June 1999 L2/99-159

To: Unicode Technical Committee  
ISO/IEC JTC1/SC2/WG2

From: STIX Project of the STIPUB Consortium (a consortium of scientific societies and scientific/technical publishers)

Subject: Request for assignment of codes to mathematical and technical symbols that do not appear in Unicode 2.0 or ISO/IEC 10646 (revised)

References: L2/98-405, Request for assignment of codes to mathematical and technical symbols that do not appear in Unicode 2.0 or ISO/IEC 10646  
L2/98-406, Proposal to encode mathematical variant tags  
L2/99-045, Proposal to encode mathematical alphanumeric symbols  
L2/99-049, Addendum to L2/98-405: Request for assignment of codes to mathematical and technical symbols

This document updates the information in the initial request (L2/98-405), incorporating corrections from the addendum (L2/99-049) and excluding the mathematical alphanumeric symbols covered by L2/99-045. Material on mathematical variant tags, introduced in L2/98-406 and expanded in L2/99-049, has been removed to a new document, L2/99-160.

## Rationale

Scientific communication and publication via the Web are currently hindered by the absence of both suitable symbol fonts and recognized methods of indicating particular symbols and their relationships to one another. The font problems of ordinary text, which are considerable irrespective of language, have so far been addressed essentially only by the introduction of the ISO 10646/Unicode standard. The special problems of handling technical texts have been examined by the W3C Math Working Group, and their MathML proposal, which is interdependent with this request, was accepted as a W3C Recommendation on 7 April 1998 [see <http://www.w3c.org/Math>]. The work of the HTML-Math WG is also related to the work of the OpenMath consortium.

The present proposal is the work of the STIX Project (scientific and technical information exchange), a working group reporting to STIPUB, a consortium of publishers of mathematical, scientific, and technical books and journals. The ultimate product of the STIX group will be the creation of one comprehensive set of fonts for scientific and technical publishing. This set of fonts should be adopted and supported by all major STM publishers, and will also be made available for general use under license but free of charge, with the explicit aim to ease and foster the uninhibited flow, exchange, and linking of scientific information. The symbol complement of the STIX font set will be based on the symbols in this proposal along with many already in Unicode, as well as variant forms not included here (because they are required by publishing house styles without different meaning from symbols included above) and additional technical symbols from areas other than mathematics.

The availability of a universal font set will benefit scientific and technical publishing in several ways:

- It will eliminate certain legal problems with distributing PDF files and publishing on the World Wide Web.
- It will ease the exchange of documents from different publishers.
- It will make the re-use of archived material simpler and more robust.

The STIX group has agreed that the basis for the organization of such a font set should be ISO 10646/Unicode. Some arguments in favor of ISO 10646/Unicode are: it is the basis for XML, and therefore for MathML, and it is the character set of the programming language Java and the operating system Windows NT. In XML documents, and most importantly for use in MathML, one must be able to identify all notation, either by numerical character reference or by entity reference. But numerical character references are ISO 10646/Unicode numbers, since that is the character set underlying XML. If entity names are used, they must still be mapped to something that applications will be able to handle and render.

In the attached charts and lists, we have included only what we believe to be unique symbols. The language of mathematics is fluid, and symbols are defined in context to represent particular mathematical concepts. The tool set of an active mathematician ideally consists of several alphabets, whose members can be distinguished from one another, to represent various classes of variables and constants, and a fairly extensive collection of similarly sized shapes to represent various operations. There are of course many fully “standardized” shapes that are now used almost exclusively to represent particular operations and relations, but even these are sometimes adopted in fields where they are not already in use and redefined to have some other particular meaning. For this reason, the “definitions” accompanying the symbols listed here are in some cases not precise; where nothing better was available, the shape is described.

## The case for alphabets

For a mathematician or other scientist, alphabets provide the symbols to represent ad hoc variables as well as a number of more well-defined concepts. Different styles of alphabets have different meanings, some of which have been formally standardized in some disciplines, but many of which follow only the strength of custom, or even current necessity.

Document L2/99-405, Proposal to encode mathematical alphanumeric symbols, catalogues the different styles of alphabets that are routinely used in mathematical and technical literature; these alphabets and digits will not be further dealt with here.

There remain, however, some individual letters from or related to these alphabets that are routinely used in a turned or inverted orientation, as well as a few symbols in the style of a particular math alphabet but not part of its normal alphabetic complement. These are considered distinct symbols, and are therefore candidates for code assignments.

## Symbols

In the tables that follow, four data elements are given for each symbol:

- a reference ID indicating location in the corresponding chart
- a \* if there is an existing symbol in Unicode or another symbol in this collection that appears to be similar
- a one-letter code indicating the class of the symbol:
  - N: normal or ordinary, e.g., symbol used as a variable
  - A: alphabetic; subclass of ordinary
  - D: diacritic
  - P: punctuation
  - B: binary operator, e.g.,  $a + b$
  - R: relation, e.g.,  $a = b$
  - L: large operator, e.g. sum, product
  - O: opening delimiter
  - C: closing delimiter
- description of the symbol, or meaning when known

Notes:

\*\* These four lowercase old Greek letters were present in Unicode 1, but removed from Unicode 2, leaving only the uppercase forms. At the December 1998 meeting, a document under discussion requested reinstatement of the lowercase forms; if that request is accepted, these four letters should be removed from this list.

\*\*\* The shape in the table is incorrect or misleading; the correct shape will be shown or described in the relevant section.

## Alphabets

6X00	[removed: U+220A]
6X01	A CAPITAL THETA, GREEK, STRAIGHT BAR (not Fita U+0472, or Cyrillic barred O U+04E8)
6X02	A OLD GREEK SMALL LETTER DIGAMMA ** U+03DD
6X03	A OLD GREEK SMALL LETTER STIGMA ** U+03DB
6X04	A OLD GREEK SMALL LETTER KOPPA ** U+03DF
6X05	A OLD GREEK SMALL LETTER SAMPI ** U+03E1
6X10	[removed; included in L2/99-045]
6X11	A SMALL LETTER J, NO DOT
6X12	N TURNED SANS SERIF CAPITAL G, GAME
6X13	[removed; included in L2/99-045]
6X14	N TURNED SANS SERIF CAPITAL L

6X15 N REVERSED SANS SERIF CAPITAL L  
 6X16 [removed; included in L2/99-045]  
 6X17 N INVERTED SANS SERIF CAPITAL Y  
 6X20 [removed; included in L2/99-045]  
 6X21 [removed; included in L2/99-045]  
 6X22 [removed; included in L2/99-045]  
 6X23 [removed; included in L2/99-045]  
 6X24 [removed; included in L2/99-045]  
 6X25 [removed; included in L2/99-045]  
 6X26 [removed; included in L2/99-045]  
 6X27 A OPEN FACE GREEK SMALL LETTER GAMMA  
 6X28 A OPEN FACE GREEK CAPITAL PI  
 6X29 L OPEN FACE SUM  
 6X30 }  
 ... } [removed; included in L2/99-045]  
 5XE9 }

	6X0	6X1	6X2
0			
1	Θ	∫	
2	F**	∅	
3	S**		
4	∅**	∟	
5	∅**	∟	
6			
7		∧	∩
8			π
9			Σ
A			
B			
C			
D			
E			
F			

	1X0	1X1	1X2	1X3	1X4	1X5	1X6	1X7	1X8
0	↕	→→	↙	↘	↗	↖	⇔	⇒	⇐
1	⇄	→→	↙	↘	↗	↖	⇔	⇒	⇐
2	←	→	↙	↘	↗	↖	⇔	⇒	⇐
3	→	↑	↙	↘	↗	↖	⇔	⇒	⇐
4	↔	↓	↘	↙	↗	↖	⇔	⇒	⇐
5		→	↘	↙	↗	↖	⇔	⇒	⇐
6	⇄	↖	↘	↙	↗	↖	⇔	⇒	⇐
7	⇄	↖	↘	↙	↗	↖	⇔	⇒	⇐
8	⇄	↖	↘	↙	↗	↖	⇔	⇒	⇐
9	⇄	↖	↘	↙	↗	↖	⇔	⇒	⇐
A	⇄	↖	↘	↙	↗	↖	⇔	⇒	⇐
B	⇄	→	↘	↙	↗	↖	⇔	⇒	⇐
C	⇄	←	↘	↙	↗	↖	⇔	⇒	⇐
D	←	→	↘	↙	↗	↖	⇔	⇒	⇐
E	→	↙	↘	↗	↖	⇔	⇒	⇐	
F	←	↘	↙	↗	↖	⇔	⇒	⇐	

## Arrows

- 1X00 R DOWNWARDS ARROW LEFTWARDS OF UPWARDS ARROW
- 1X01 R THREE RIGHTWARDS ARROWS
- 1X02 R LEFTWARDS OPEN-HEADED ARROW
- 1X03 R RIGHTWARDS OPEN-HEADED ARROW
- 1X04 R LEFT RIGHT OPEN-HEADED ARROW
- 1X05 [removed: U+21D4]
- 1X06 R TWO-HEADED MAPSTO
- 1X07 \* R MAPS TO, LEFTWARDS DOUBLE ARROW
- 1X08 \* R MAPS TO, RIGHTWARDS DOUBLE ARROW
- 1X09 R DOWNWARDS ARROW WITH BAR

1X0A R UPWARDS ARROW WITH BAR  
1X0B R UPWARDS TRIPLE ARROW  
1X0C R DOWNWARDS TRIPLE ARROW  
1X0D R LEFTWARDS BROKEN ARROW  
1X0E R RIGHTWARDS BROKEN ARROW  
1X0F R LEFTWARDS DOUBLY BROKEN ARROW  
1X10 R RIGHTWARDS DOUBLY BROKEN ARROW  
1X11 R TWO-HEADED RIGHTWARDS BROKEN ARROW  
1X12 R RIGHTWARDS ARROW WITH DOTTED STEM  
1X13 R UPWARDS ARROW TO BAR  
1X14 R DOWNWARDS ARROW TO BAR  
1X15 R BIJECTIVE MAPPING, RIGHTWARDS TWO-HEADED ARROW WITH TAIL  
1X16 R LEFTWARDS ARROW-TAIL  
1X17 R RIGHTWARDS ARROW-TAIL  
1X18 R LEFTWARDS DOUBLE ARROW-TAIL  
1X19 R RIGHTWARDS DOUBLE ARROW-TAIL  
1X1A R LEFTWARDS ARROW TO FILLED SQUARE  
1X1B R RIGHTWARDS ARROW TO FILLED SQUARE  
1X1C R LEFTWARDS ARROW-BAR TO FILLED SQUARE  
1X1D R RIGHTWARDS ARROW-BAR TO FILLED SQUARE  
1X1E R NORTH WEST-SOUTH EAST ARROW  
1X1F R NORTH EAST-SOUTH WEST ARROW  
1X20 R NORTH WEST ARROW WITH HOOK  
1X21 R NORTH EAST ARROW WITH HOOK  
1X22 R SOUTH EAST ARROW WITH HOOK  
1X23 R SOUTH WEST ARROW WITH HOOK  
1X24 R NORTH WEST AND NORTH EAST ARROWS  
1X25 R NORTH EAST AND SOUTH EAST ARROWS  
1X26 R SOUTH EAST AND SOUTH WEST ARROWS  
1X27 R SOUTH WEST AND NORTH WEST ARROWS  
1X28 RISING DIAGONAL OVER FALLING DIAGONAL  
1X29 FALLING DIAGONAL OVER RISING DIAGONAL  
1X2A SOUTH EAST ARROW OVER NORTH EAST ARROW  
1X2B NORTH EAST ARROW OVER SOUTH EAST ARROW  
1X2C FALLING DIAGONAL OVER NORTH EAST ARROW  
1X2D RISING DIAGONAL OVER SOUTH EAST ARROW  
1X2E NORTH EAST ARROW OVER NORTH WEST ARROW  
1X2F NORTH WEST ARROW OVER NORTH EAST ARROW  
1X30 \* R RIGHTWARDS ARROW-CURVED  
1X31 R NOT RIGHTWARDS ARROW-CURVED [composed: 1X30 + U+0337]  
1X32 R NOT RIGHTWARDS ARROW-WAVY [composed: U+219D + U+0337]  
1X33 \* R LEFTWARDS DOWNWARDS CURVED ARROW  
1X34 \* R RIGHTWARDS DOWNWARDS CURVED ARROW  
1X35 R LEFTWARDS, CURVED, DOWNWARDS ARROW  
1X36 R RIGHTWARDS, CURVED, DOWNWARDS ARROW  
1X37 R LEFTWARDS UNDERCURVING ARROW  
1X38 R RIGHTWARDS UNDERCURVING ARROW  
1X39 R CURVED RIGHTWARDS ARROW WITH MINUS  
1X3A R CURVED LEFTWARDS ARROW WITH PLUS  
1X3B \* R ANTICLOCKWISE CLOSED CIRCLE ARROW  
1X3C \* R CLOCKWISE CLOSED CIRCLE ARROW  
1X3D R LEFTWARDS ARROW OVER SHORT RIGHTWARDS ARROW \*\*\*  
1X3E R RIGHTWARDS ARROW OVER SHORT LEFTWARDS ARROW \*\*\*  
1X3F R SHORT RIGHTWARDS ARROW OVER LEFTWARDS ARROW \*\*\*

1X40 R RIGHTWARDS ARROW, PLUS  
1X41 R LEFTWARDS ARROW, PLUS  
1X42 R RIGHTWARDS ARROW THROUGH X  
1X43 R LEFTWARDS AND RIGHTWARDS ARROW WITH A CIRCLE  
1X44 R UPWARDS TWO-HEADED ARROW ABOVE CIRCLE  
1X45 RIGHT ANGLE WITH DOWNWARDS ZIG-ZAG ARROW  
1X46 R LEFT-UP-RIGHT-DOWN HARPOON  
1X47 R LEFT-DOWN-RIGHT-UP HARPOON  
1X48 R UP-RIGHT-DOWN-LEFT HARPOON  
1X49 R UP-LEFT-DOWN-RIGHT HARPOON  
1X4A R LEFT-UP-RIGHT-UP HARPOON  
1X4B R UP-RIGHT-DOWN-RIGHT HARPOON  
1X4C R LEFT-DOWN-RIGHT-DOWN HARPOON  
1X4D R UP-LEFT-DOWN-LEFT HARPOON  
1X4E R LEFTWARDS HARPOON-UP TO BAR  
1X4F R RIGHTWARDS HARPOON-UP TO BAR  
1X50 R UPWARDS HARPOON-RIGHT TO BAR  
1X51 R DOWNWARDS HARPOON-RIGHT TO BAR  
1X52 R LEFTWARDS HARPOON DOWN TO BAR  
1X53 R RIGHTWARDS HARPOON DOWN TO BAR  
1X54 R UPWARDS HARPOON-LEFT TO BAR  
1X55 R DOWNWARDS HARPOON-LEFT TO BAR  
1X56 R LEFTWARDS HARPOON-UP FROM BAR  
1X57 R RIGHTWARDS HARPOON-UP FROM BAR  
1X58 R UPWARDS HARPOON-RIGHT FROM BAR  
1X59 R DOWNWARDS HARPOON-RIGHT FROM BAR  
1X5A R LEFTWARDS HARPOON-DOWN FROM BAR  
1X5B R RIGHTWARDS HARPOON-DOWN FROM BAR  
1X5C R UPWARDS HARPOON-LEFT FROM BAR  
1X5D R DOWNWARDS HARPOON-LEFT FROM BAR  
1X5E R LEFTWARDS HARPOON-UP OVER LEFTWARDS HARPOON-DOWN  
1X5F R UPWARDS HARPOON-LEFT, UPWARDS HARPOON-RIGHT  
1X60 R RIGHTWARDS HARPOON-UP OVER RIGHTWARDS HARPOON-DOWN  
1X61 R DOWNWARDS HARPOON-LEFT, DOWNWARDS HARPOON-RIGHT  
1X62 R LEFTWARDS HARPOON-UP OVER RIGHTWARDS HARPOON-UP  
1X63 R LEFTWARDS HARPOON-DOWN OVER RIGHTWARDS HARPOON-DOWN  
1X64 R RIGHTWARDS HARPOON-UP OVER LEFTWARDS HARPOON-UP  
1X65 R RIGHTWARDS HARPOON-DOWN OVER LEFTWARDS HARPOON-DOWN  
1X66 R LEFTWARDS HARPOON-UP OVER LONG DASH  
1X67 R LEFTWARDS HARPOON-DOWN BELOW LONG DASH  
1X68 R RIGHTWARDS HARPOON-UP OVER LONG DASH  
1X69 R RIGHTWARDS HARPOON-DOWN BELOW LONG DASH  
1X6A R UPWARDS HARPOON, DOWNWARDS HARPOON  
1X6B R DOWNWARDS HARPOON, UPWARDS HARPOON  
1X6C R RIGHT DOUBLE ARROW WITH ROUNDED HEAD (looks like thin superset)

\*\*\* 1X3D, 1X3E, 1X3F: the head of the short arrow in each instance should line up with the tail end of the long arrow.

### Combinations with arrows

1X70 R EQUAL ABOVE RIGHTWARDS ARROW

1X71 R SIMILAR ABOVE RIGHTWARDS ARROW  
1X72 R RIGHTWARDS ARROW ABOVE ALMOST EQUAL TO  
1X73 R LEFTWARDS ARROW ABOVE SIMILAR  
1X74 R RIGHTWARDS ARROW ABOVE SIMILAR  
1X75 R LESS THAN ABOVE LEFTWARDS ARROW  
1X76 R LEFTWARDS ARROW THROUGH LESS THAN  
1X77 R GREATER THAN ABOVE RIGHTWARDS ARROW  
1X78 R SUBSET ABOVE RIGHTWARDS ARROW  
1X79 R LEFTWARDS ARROW THROUGH SUBSET  
1X7A R SUPERSET ABOVE LEFTWARDS ARROW

### **Fish tails**

1X80 \* R LEFT FISH TAIL  
1X81 \* R RIGHT FISH TAIL  
1X82 R UP FISH TAIL  
1X83 R DOWN FISH TAIL



	2X0	2X1	2X2	2X3	2X4	2X5	2X6	2X7	2X8
0	€	⊘	⊙	ƒ	‡	⊘	⊏	⊏	△
1	⊘	⊘	⊕	ƒ	‡	⊘	⊏	⊏	∇
2	⊘	⊘	⊗	ƒ	‡	⊗	⊏	⊗	∇
3	€		⊏	ƒ	‡	⊗	⊏	∧	
4	⊘		⊏	ƒ	‡	⊗	⊏	∇	
5	€		⊏	ƒ	‡	⊗	⊏	∧	
6	⊘		⊏	ƒ	‡	⊗	⊏	∇	
7	⊘		⊗	ƒ	‡	⊗	⊏	∧	
8	⊘		∧	ƒ	‡	⊏	⊏	∧	
9	⊘		⊗	ƒ	‡	⊏	⊏	∇	
A	⊘		⊗	ƒ	‡		⊏	∧	
B	⊘		⊗	ƒ	‡		⊏	∧	
C			ƒ	⊗	×		⊏	∇	
D	⊘		ƒ	⊗	×		⊏	∇	
E	⊘		ƒ		×		⊏	∧	
F	⊘		ƒ		×		⊏	∧	

## Membership

- 2X00 R SET MEMBERSHIP, LONG HORIZONTAL STROKE  
2X01 R SET MEMBERSHIP, VERTICAL BAR ON HORIZONTAL STROKE  
2X02 R LARGE SET MEMBERSHIP, VERTICAL BAR ON HORIZONTAL STROKE  
2X03 R SET MEMBERSHIP, DOT ABOVE [composed: U+2208 + U+0307]  
2X04 R SET MEMBERSHIP, UNDERBAR [composed: U+2208 + U+0332]  
2X05 R SLASHED STRAIGHTBACK EPSILON [composed: U+220A + U+0338]  
2X06 R NEGATED SET MEMBERSHIP, VARIANT (VERTICAL SLASH) [composed: U+2208+ U+20D2]  
2X07 R NEGATED STRAIGHTBACK EPSILON, VARIANT (OVERBAR) [composed: U+220A + U+0305]  
2X08 R NEGATED SET MEMBERSHIP, VARIANT (OVERBAR) [composed: U+2208 + U+0305]

2X09 R NEGATED SET MEMBERSHIP, DOT ABOVE [composed: U+2209 + U+0307]  
 2X0A R SET MEMBERSHIP, TWO HORIZONTAL STROKES  
 2X0B R NEGATED SET MEMBERSHIP, TWO HORIZONTAL STROKES [composed: 2X0A + U+0338]  
 2X0C [removed: U+220D]  
 2X0D R CONTAINS, LONG HORIZONTAL STROKE  
 2X0E R CONTAINS, VERTICAL BAR ON HORIZONTAL STROKE  
 2X0F R LARGE CONTAINS, VERTICAL BAR ON HORIZONTAL STROKE  
 2X10 R SLASHED BACKWARDS STRAIGHTBACK EPSILON [composed: U+220D + U+0338]  
 2X11 R NEGATED BACKWARDS STRAIGHTBACK EPSILON, VARIANT (OVERBAR) [composed: U+220D + U+0305]  
 2X12 R NEGATED CONTAINS, VARIANT (OVERBAR) [composed: U+220B + U+0305]

## Large operators

2X20 \* L CIRCLE DOT OPERATOR  
 2X21 \* L CIRCLE PLUS OPERATOR  
 2X22 \* L CIRCLE TIMES OPERATOR  
 2X23 \* L UNION OPERATOR WITH DOT  
 2X24 \* L UNION OPERATOR WITH PLUS  
 2X25 \* L SQUARE INTERSECTION OPERATOR  
 2X26 \* L SQUARE UNION OPERATOR  
 2X27 \* L TWO LOGICAL OR OPERATOR  
 2X28 \* L TWO LOGICAL AND OPERATOR  
 2X29 L BIG TIMES OPERATOR  
 2X2A L SUMMATION WITH INTEGRAL  
 2X2B L QUADRUPLE INTEGRAL OPERATOR [composed: U+222B + U+222B + U+222B + U+222B]  
 2X2C \* L FINITE PART INTEGRAL  
 2X2D L INTEGRAL, DOUBLE BARRED  
 2X2E L INTEGRAL, AVERAGE (SLASHED)  
 2X2F \* L CIRCULATION FUNCTION  
 2X30 L ANTI CLOCK-WISE INTEGRATION  
 2X31 L LINE INTEGRATION, RECTANGULAR PATH AROUND POLE  
 2X32 L LINE INTEGRATION, SEMI-CIRCULAR PATH AROUND POLE  
 2X33 L LINE INTEGRATION, NOT INCLUDING THE POLE  
 2X34 L INTEGRAL AROUND A POINT OPERATOR  
 2X35 \* L QUATERNION INTEGRAL OPERATOR  
 2X36 L INTEGRAL, LEFTWARDS ARROW WITH HOOK  
 2X37 L INTEGRAL, CROSSED BY TIMES SIGN  
 2X38 L INTEGRAL, OVERPRINTED WITH CAP  
 2X39 L INTEGRAL, OVERPRINTED WITH CUP  
 2X3A L UPPER INTEGRAL (OVERBAR) [composed: U+222B + U+0305]  
 2X3B L LOWER INTEGRAL (UNDERBAR) [composed: U+222B + U+0332]  
 2X3C L JOIN (large bowtie, relational database theory)  
 2X3D L LARGE LEFT TRIANGLE OPERATOR (relational database theory)

## Binary operators

2X40 B PLUS SIGN, SMALL CIRCLE ABOVE [composed: U+002B + U+030A]  
 2X41 B PLUS SIGN, CIRCUMFLEX ACCENT ABOVE [composed: U+002B + U+0302]  
 2X42 B PLUS SIGN, TILDE ABOVE [composed: U+002B + U+0303]  
 2X43 B PLUS SIGN, DOT BELOW [composed: U+002B + U+0323]  
 2X44 B PLUS SIGN, TILDE BELOW [composed: U+002B + U+0330]  
 2X45 B PLUS SIGN, SUB TWO; NIM-ADDITION

2X46 B FILLED TRIANGLE WITH PLUS  
 2X47 B MINUS SIGN, COMMA ABOVE [composed: U+2212 + U+0313]  
 2X48 B MINUS SIGN, DOT BELOW [composed: U+2212 + U+0323]  
 2X49 B PLUS SIGN IN LEFT HALF CIRCLE  
 2X4A B PLUS SIGN IN RIGHT HALF CIRCLE  
 2X4B B SMALL, BOLD TIMES  
 2X4C B MULTIPLICATION SIGN, DOT ABOVE [composed: U+00D7 + U+0307]  
 2X4D B MULTIPLICATION SIGN, UNDERBAR [composed: U+00D7 + U+0332]  
 2X4E B SEMIDIRECT PRODUCT: TIMES SIGN, BOTTOM CLOSED  
 2X4F B SMASH PRODUCT  
 2X50 B MULTIPLY SIGN IN LEFT HALF CIRCLE  
 2X51 B MULTIPLY SIGN IN RIGHT HALF CIRCLE  
 2X52 B MULTIPLY SIGN IN CIRCLE, CIRCUMFLEX ACCENT  
 2X53 B MULTIPLY SIGN IN DOUBLE CIRCLE  
 2X54 \* B DIVIDE IN CIRCLE  
 2X55 B PLUS IN TRIANGLE  
 2X56 B MINUS IN TRIANGLE  
 2X57 B MULTIPLY IN TRIANGLE  
 2X58 \* B INTERIOR PRODUCT  
 2X59 \* B RIGHTHAND INTERIOR PRODUCT  
 2X5A [removed: U+005C]  
 2X60 \* B AMALGAMATION OR COPRODUCT  
 2X61 B INTERSECTION, WITH DOT  
 2X62 B UNION, OVERBAR [composed: U+222A + U+0305]  
 2X63 B INTERSECTION, OVERBAR [composed: U+2229 + U+0305]  
 2X64 B INTERSECTION, AND  
 2X65 B UNION, OR  
 2X66 B UNION ABOVE INTERSECTION  
 2X67 B INTERSECTION ABOVE UNION  
 2X68 B UNION, BAR, INTERSECTION  
 2X69 B INTERSECTION, BAR, UNION  
 2X6A B UNION, UNION, JOINED  
 2X6B B INTERSECTION, INTERSECTION, JOINED  
 2X6C B UNION, SERIFS  
 2X6D B INTERSECTION, SERIFS  
 2X6E B CLOSED UNION, SERIFS  
 2X6F B CLOSED INTERSECTION, SERIFS  
 2X70 B SQUARE UNION, SERIFS  
 2X71 B SQUARE INTERSECTION, SERIFS  
 2X72 B CLOSED UNION, SERIFS, SMASH PRODUCT  
 2X73 B LOGICAL AND, DOT ABOVE  
 2X74 B LOGICAL OR, DOT ABOVE  
 2X75 \* B DOUBLE LOGICAL AND  
 2X76 \* B DOUBLE LOGICAL OR  
 2X77 \* B TWO LOGICAL AND  
 2X78 \* B TWO LOGICAL OR  
 2X79 B SLOPING LARGE OR  
 2X7A B SLOPING LARGE AND  
 2X7B B LOGICAL AND WITH MIDDLE STEM  
 2X7C B LOGICAL OR WITH MIDDLE STEM  
 2X7D B LOGICAL OR, HORIZONTAL DASH [composed: U+2228 + U+0336]  
 2X7E B LOGICAL AND, HORIZONTAL DASH [composed: U+2227 + U+0336]  
 2X7F \* B LOGICAL AND, DOUBLE OVERBAR [composed: U+2227 + U+033F]  
 2X80 B LOGICAL AND, UNDERBAR [composed: U+2227 + U+0332]

2X81 \* B SMALL VEE, UNDERBAR

[composed: U+2304 + U+0332]

2X82 \* B LOGICAL OR, DOUBLE UNDERBAR

[composed: U+2228 + U+0333]

	3X0	3X1	3X2	3X3	3X4	3X5	3X6	3X7	3X8	3X9
0	≡̇	≡̈	≠̂	≠̃	≠̄	≠̅	≠̆	≠̇	≠̈	≠̉
1	≠̊	≡̋	≠̌	≠̍	≠̎	≠̏	≠̐	≠̑	≠̒	≠̓
2	≠̔	≡̌	≠̕	≠̖	≠̗	≠̘	≠̙	≠̚	≠̛	≠̜
3	≠̝	≡̍	≠̞	≠̟	≠̠	≠̡	≠̢	≠̣	≠̤	≠̥
4	≠̦	≠̧	≠̨	≠̩	≠̪	≠̫	≠̬	≠̭	≠̮	≠̯
5	≠̰	≠̱	≠̲	≠̳	≠̴	≠̵	≠̶	≠̷	≠̸	
6	≠̹	≠̺	≠̻	≠̼	≠̽	≠̾	≠̿	≠̿̇	□	
7	≠̿̈	≠̿̉	≠̿̊	≠̿̋	≠̿̌	≠̿̍	≠̿̎	≠̿̏	□	
8	≠̿̐	≠̿̑	≠̿̒	≠̿̓	≠̿̔	≠̿̕	≠̖̿	≠̗̿	□	
9	≠̘̿	≠̙̿	≠̿̚	≠̛̿	≠̜̿		≠̞̿	≠̟̿	□	
A	≠̠̿	≠̡̿	≠̢̿	≠̣̿	≠̤̿		≠̦̿	≠̧̿	≠̨̿	
B	≠̩̿	≠̪̿	≠̫̿	≠̬̿	△		≠̮̿	≠̯̿		
C	≠̰̿	≠̱̿	≠̲̿	≠̳̿	△		≠̶̿	≠̷̿		
D	≠̴̿	≠̵̿	≠̶̿	≠̷̿	△		≠̹̿	≠̺̿		
E	≠̸̿	≠̹̿	≠̺̿		△		≠̼̿	≠̿̽		
F	≠̿̾	≠̿̿	≠̿̿̇				≠̿̿̉	≠̿̿̊		

**Relations: equal, similar, inequalities**

3X00 R EQUALS SIGN, DOT BELOW

[composed: U+003D + U+0323]

3X01 R NOT EQUAL TO, DOT

[composed: U+2260 + U+0307]

3X02 R REVERSE NOT EQUAL

[composed: U+003D + 7X0D]

3X03 R REVERSE NOT EQUIVALENT

[composed: U+2261 + 7X0D]

3X04 R TILDE OPERATOR, DOT

[composed: U+223C + U+0307]

3X05 \* R NOT EQUAL OR SIMILAR

[composed: U+2242 + U+0338]

3X06 \* R NOT APPROXIMATELY IDENTICAL TO

[composed: U+224B + U+0338]

3X07 R CONGRUENT, DOT [composed: U+2245 + U+0307]  
3X08 R NOT CONGRUENT, DOT [composed: U+2247 + U+0307]  
3X09 \* R REVERSE CONGRUENT  
3X0A R APPROXIMATE, CIRCUMFLEX ACCENT [composed: U+2248 + U+0302]  
3X0B R APPROXIMATELY EQUAL OR EQUAL TO  
3X0C R NOT APPROXIMATELY EQUAL OR EQUAL TO [composed: 3X0B + U+0338]  
3X0D EQUALS, PLUS  
3X0E B PLUS, EQUALS  
3X0F \* R EQUAL, SIMILAR  
3X10 R DOUBLE COLON, EQUALS  
3X11 R TWO CONSECUTIVE EQUAL SIGNS  
3X12 \* R EQUALS SIGN WITH FOUR DOTS  
3X13 R EQUIVALENT, FOUR DOTS ABOVE [composed: U+2261 + U+20DC]  
3X14 R LESS THAN, CIRCLE INSIDE  
3X15 R GREATER THAN, CIRCLE INSIDE  
3X16 R LESS THAN, QUESTION MARK ABOVE  
3X17 R GREATER THAN, QUESTION MARK ABOVE  
3X18 \* R LESS-THAN-OR-EQUAL, SLANTED  
3X19 \* R GREATER-OR-EQUAL, SLANTED  
3X1A R LESS-THAN-OR-EQUAL, SLANTED, DOT INSIDE  
3X1B R GREATER-THAN-OR-EQUAL, SLANTED, DOT INSIDE  
3X1C R LESS-THAN-OR-EQUAL, SLANTED, DOT ABOVE  
3X1D R GREATER-THAN-OR-EQUAL, SLANTED, DOT ABOVE  
3X1E R LESS-THAN-OR-EQUAL, SLANTED, DOT ABOVE RIGHT  
3X1F R GREATER-THAN-OR-EQUAL, SLANTED, DOT ABOVE LEFT  
3X20 \* R LESS, APPROXIMATE  
3X21 \* R GREATER, APPROXIMATE  
3X22 \* R LESS, NOT EQUALS  
3X23 \* R GREATER, NOT EQUALS  
3X24 \* R LESS, NOT APPROXIMATE  
3X25 \* R GREATER, NOT APPROXIMATE  
3X26 \* R NOT LESS-THAN-OR-EQUAL [composed: U+2264 + U+0338]  
3X27 \* R NOT GREATER-THAN-OR-EQUAL [composed: U+2265 + U+0338]  
3X28 \* R NOT LESS, DOUBLE EQUALS [composed: U+2266 + U+0338]  
3X29 \* R NOT GREATER, DOUBLE EQUALS [composed: U+2267 + U+0338]  
3X2A \* R LESS, EQUAL, SLANTED, GREATER  
3X2B \* R GREATER, EQUAL, SLANTED, LESS  
3X2C \* R LESS, DOUBLE EQUALS, GREATER  
3X2D \* R GREATER, DOUBLE EQUALS, LESS  
3X2E R LESS, SIMILAR, EQUAL  
3X2F R GREATER, SIMILAR, EQUAL  
3X30 R LESS, SIMILAR, GREATER  
3X31 R GREATER, SIMILAR, LESS  
3X32 R LESS, GREATER, EQUAL  
3X33 R GREATER, LESS, EQUAL  
3X34 R LESS, EQUAL, SLANTED, GREATER, EQUAL, SLANTED  
3X35 R GREATER, EQUAL, SLANTED, LESS, EQUAL, SLANTED  
3X36 \* R EQUAL-OR-LESS, SLANTED  
3X37 \* R EQUAL-OR-GREATER SLANTED  
3X38 R EQUAL-OR-LESS, SLANTED, DOT INSIDE  
3X39 R EQUAL-OR-GREATER, SLANTED, DOT INSIDE  
3X3A \* R SIMILAR, LESS  
3X3B \* R SIMILAR, GREATER  
3X3C R SIMILAR, LESS, EQUAL

3X3D R SIMILAR, GREATER, EQUAL  
 3X40 R DOUBLE NESTED LESS-THAN SIGN; ABSOLUTE CONTINUITY  
 3X41 R DOUBLE NESTED GREATER-THAN SIGN  
 3X42 R DOUBLE LESS-THAN WITH UNDERBAR \*\*\* [composed: U+226A + U+0332]  
 3X43 R NOT DOUBLE NESTED LESS-THAN SIGN [composed: 3X40 + U+0338]  
 3X44 R NOT DOUBLE NESTED GREATER-THAN SIGN [composed: 3X41 + U+0338]  
 3X45 R NOT MUCH LESS THAN [composed: U+226A + U+0338]  
 3X46 R NOT MUCH GREATER THAN [composed: U+226B + U+0338]  
 3X47 R NOT TRIPLE LESS THAN [composed: U+22D8 + U+0338]  
 3X48 R NOT TRIPLE GREATER THAN [composed: U+22D9 + U+0338]  
 3X49 R GREATER, LESS, OVERLAPPING  
 3X4A R GREATER, LESS, APART  
 3X4B R LESS THAN, CLOSED BY CURVE  
 3X4C R GREATER THAN, CLOSED BY CURVE  
 3X4D R LESS THAN, CLOSED BY CURVE, EQUAL, SLANTED  
 3X4E R GREATER THAN, CLOSED BY CURVE, EQUAL, SLANTED  
 3X50 R SMALLER THAN  
 3X51 R LARGER THAN  
 3X52 R SMALLER THAN OR EQUAL [composed: 3X50 + U+0332]  
 3X53 R LARGER THAN OR EQUAL [composed: 3X51 + U+0332]  
 3X54 R SMALLER THAN OR EQUAL, SLANTED  
 3X55 R LARGER THAN OR EQUAL, SLANTED  
 3X56 \* R NOT BUMPY EQUALS [composed: U+224E + U+0338]  
 3X57 R NOT BUMPY SINGLE EQUALS [composed: U+224F + U+0338]  
 3X58 \* R BUMPY, DOUBLE EQUALS

\*\*\* 3X41: the shape should be an ordinary double less-than, not the nested one, with an underbar ( $\leq$ ).

### Relations: precede, succeed

3X60 \* R SUCCEEDS, EQUALS [composed: U+227B + U+0332]  
 3X61 \* R PRECEDES, EQUALS [composed: U+227A + U+0332]  
 3X62 \* R PRECEDES, DOUBLE EQUALS  
 3X63 \* R SUCCEEDS, DOUBLE EQUALS  
 3X64 \* R PRECEDES, NOT DOUBLE EQUALS  
 3X65 \* R SUCCEEDS, NOT DOUBLE EQUALS  
 3X66 \* R SUCCEEDS, APPROXIMATE  
 3X67 \* R PRECEDES, APPROXIMATE  
 3X68 \* R PRECEDES, NOT APPROXIMATE  
 3X69 \* R SUCCEEDS, NOT APPROXIMATE  
 3X6A \* R NOT PRECEDES, EQUALS [composed: 3X61 + U+0338]  
 3X6B \* R NOT SUCCEEDS, EQUALS [composed: 3X60 + U+0338]  
 3X6C \* R NOT PRECEDES, SIMILAR [composed: U+227E + U+0338]  
 3X6D \* R NOT SUCCEEDS, SIMILAR [composed: U+227F + U+0338]  
 3X6E R DOUBLE PRECEDES  
 3X6F R DOUBLE SUCCEEDS

### Relations: subset, superset

3X70 R SUBSET, WITH DOT  
 3X71 R SUPERSET, WITH DOT  
 3X72 R SUBSET, PLUS

3X73 R SUPERSET, PLUS  
 3X74 R SUBSET, MULTIPLY  
 3X75 R SUPERSET, MULTIPLY  
 3X76 R SUBSET, EQUALS, DOT [composed: U+2286 + U+0307]  
 3X77 R SUPERSET, EQUALS, DOT [composed: U+2287 + U+0307]  
 3X78 \* R SUBSET, DOUBLE EQUALS  
 3X79 \* R SUPERSET, DOUBLE EQUALS  
 3X7A R SUBSET, SIMILAR  
 3X7B R SUPERSET, SIMILAR  
 3X7C \* R SUBSET, NOT EQUALS, VARIANT  
 3X7D \* R SUPERSET, NOT EQUALS, VARIANT  
 3X7E \* R SUBSET, NOT DOUBLE EQUALS  
 3X7F \* R SUPERSET, NOT DOUBLE EQUALS  
 3X80 \* R SUBSET NOT DOUBLE EQUALS, VARIANT  
 3X81 \* R SUPERSET NOT DOUBLE EQUALS, VARIANT  
 3X82 \* R NOT SUBSET, DOUBLE EQUALS [composed: 3X78 + U+0338]  
 3X83 \* R NOT SUPERSET, DOUBLE EQUALS [composed: 3X79 + U+0338]  
 3X84 \* R NOT, SQUARE SUBSET [composed: U+228F + U+0338]  
 3X85 \* R NOT, SQUARE SUPERSET [composed: U+2290 + U+0338]  
 3X86 R SUBSET, CLOSED  
 3X87 R SUPERSET, CLOSED  
 3X88 R SUBSET, CLOSED, EQUALS  
 3X89 R SUPERSET, CLOSED, EQUALS  
 3X8A R SUBSET ABOVE SUPERSET  
 3X8B R SUPERSET ABOVE SUBSET  
 3X8C R SUBSET ABOVE SUBSET  
 3X8D R SUPERSET ABOVE SUPERSET  
 3X8E R SUPERSET, SUBSET  
 3X8F R SUPERSET, SUBSET, JOINED BY DASH

### Relations: forks

3X90 R FORK, VARIANT  
 3X91 R FORK WITH TOP  
 3X92 \* R TRANSVERSAL INTERSECTION  
 3X93 R FORKING (SLASHED, ALTHOUGH POSITIVE) \*\*\*  
 3X94 R NONFORKING (NEGATIVE, SLASH ABSENT) \*\*\*

\*\*\* 3X93, 3X94: The base symbol should be shaped more like an anchor, constructed (approximately) like a perpendicular symbol with the lower bar replaced by U+2323. 3X93 ( $\perp$ ) is slashed although not negative, and 3X94 ( $\lrcorner$ ), though negative, is without a slash.

	4X0	4X1	4X2	4X3	4X4	4X5	4X6
0	≡		⌋		⌋	⌋	⌋
1	≡		⌋		⌋	⌋	⌋
2	≡		⌋	—	⌋	⌋	⌋
3	≡		⌋	—	⌋	⌋	⌋
4	⌋		⌋		⌋	⌋	⌋
5	⌋		⌋		⌋	⌋	⌋
6	≡		⌋		⌋	⌋	⌋
7	≡		⌋		⌋	⌋	⌋
8	≡		⌋		⌋	⌋	
9	≡	⌋			⌋	⌋	
A	≡	⌋	⌋		⌋	⌋	
B	≡	⌋	⌋		⌋		
C	≡	⌋	⌋				
D		⌋					
E		⌋					
F		⌋					

## Turnstiles

- 4X00 R VERTICAL, TRIPLE DASH; ORDINARILY SATISFIES
- 4X01 R DASH, DOUBLE VERTICAL
- 4X02 R DOUBLE DASH, VERTICAL
- 4X03 \* R VERTICAL, DASH (LONG)
- 4X04 R VERT, LOW BAR TO LEFT FROM BASE
- 4X05 R VERT, LOW BAR TO RIGHT FROM BASE
- 4X06 R VERT, DOUBLE BAR (OVER)
- 4X07 R VERT, DOUBLE BAR (UNDER)
- 4X08 R DOUBLE BAR, VERTICAL OVER AND UNDER
- 4X09 R DOUBLE VERTICAL, BAR OVER



4X0A \* R DOUBLE VERTICAL, BAR UNDER (independence, probability theory)  
 4X0B R NOT WITH TWO HORIZONTAL STROKES  
 4X0C R REVERSE NOT WITH TWO HORIZONTAL STROKES

## Delimiters

4X10 [removed: U+007C]  
 4X11 [removed: U+007C]  
 4X12 [removed: U+2016]  
 4X13 [removed: U+2016]  
 4X14 [removed: 4X47]  
 4X15 [removed: U+3018]  
 4X16 [removed: U+3019]  
 4X17 [removed: U+301A]  
 4X18 [removed: U+301B]  
 4X19 O LEFT WHITE BRACE  
 4X1A C RIGHT WHITE BRACE  
 4X1B \* O LEFT WHITE ANGULAR BRACKET  
 4X1C \* C RIGHT WHITE ANGULAR BRACKET  
 4X1D O LEFT BRACKET, EQUAL  
 4X1E C RIGHT BRACKET, EQUAL  
 4X1F O LEFT BRACKET, REVERSE SOLIDUS TOP CORNER  
 4X20 C RIGHT BRACKET, REVERSE SOLIDUS BOTTOM CORNER  
 4X21 O LEFT BRACKET, SOLIDUS BOTTOM CORNER  
 4X22 C RIGHT BRACKET, SOLIDUS TOP CORNER  
 4X23 O LEFT ANGLE, DOT  
 4X24 C RIGHT ANGLE, DOT  
 4X25 \* O LEFT ARC, LESS  
 4X26 \* C RIGHT ARC, GREATER  
 4X27 DOUBLE LEFT ARC, GREATER  
 4X28 DOUBLE RIGHT ARC, LESS  
 4X29 [removed: U+2222]  
 4X2A GREATER THAN, LEFT ARC  
 4X2B RIGHT MOUSTACHE  
 4X2C LEFT MOUSTACHE  
 4X30 [removed: U+FE35]  
 4X31 [removed: U+FE36]  
 4X32 OVER BRACKET  
 4X33 UNDER BRACKET  
 4X34 [removed: U+FE37]  
 4X35 [removed: U+FE38]

## Vertical non-delimiters

4X40 R REVERSE NMID  
 4X41 R CIRCLE, MID BELOW  
 4X42 R MID, CIRCLE BELOW  
 4X43 N TOP, CIRCLE BELOW  
 4X44 R PARALLEL, SIMILAR  
 4X45 R PARALLEL, SLANTED  
 4X46 R NOT PARALLEL, SLANTED [composed: 4X45 + 7X0D]  
 4X47 B TRIPLE VERTICAL BAR (BINARY OPERATOR)

4X48 DOUBLY BROKEN VERT  
4X49 THREE CLOSE DOTS VERTICAL (ellipsis)  
4X4A FOUR CLOSE DOTS VERTICAL (ellipsis)  
4X4B VERTICAL ZIG-ZAG LINE

## Angles

4X50 RIGHT ANGLE, VARIANT (WITH SQUARE)  
4X51 RIGHT ANGLE-MEASURED, DOT  
4X52 ANGLE, S INSIDE  
4X53 ANGLE (ACUTE), INVERTED  
4X54 ANGLE, DOWN AND LEFT  
4X55 ANGLE, UP AND LEFT  
4X56 ANGLE, EQUAL  
4X57 REVERSE ANGLE, EQUAL  
4X58 NOT, VERTICAL, ANGLE [composed: U+2220 + U+20D2]  
4X59 LARGE DOWNWARD POINTING ANGLE  
4X5A LARGE UPWARD POINTING ANGLE  
4X60 ANGLE-MEASURED, ARROW, UP, RIGHT  
4X61 ANGLE-MEASURED, ARROW, UP, LEFT  
4X62 ANGLE-MEASURED, ARROW, DOWN, RIGHT  
4X63 ANGLE-MEASURED, ARROW, DOWN, LEFT  
4X64 ANGLE-MEASURED, ARROW, RIGHT, UP  
4X65 ANGLE-MEASURED, ARROW, LEFT, UP  
4X66 ANGLE-MEASURED, ARROW, RIGHT, DOWN  
4X67 ANGLE-MEASURED, ARROW, LEFT, DOWN

	5X0	5X1	5X2	5X3	5X4
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
A					***
B					
C					
D					
E					
F					

	7X0	7X1	7X2	7X3	7X4
0	*	-	-		
1		:			
2		...	~		
3		#	⇒		
4		7			
5		∖	≠		
6		/			
7		∖			
8					
9					
A					
B					
C					
D					
E					
F					

### Empty set, circles, squares, triangles

- 5X00 N CIRCLE, REVERSED SLASH [composed: U+25CB + 7X0D]
- 5X01 N CIRCLE, SLASH, BAR ABOVE [composed: U+2205 + U+0305]
- 5X02 N CIRCLE, SLASH, SMALL CIRCLE ABOVE
- 5X03 N CIRCLE, SLASH, RIGHT ARROW ABOVE
- 5X04 N CIRCLE, SLASH, LEFT ARROW ABOVE
- 5X05 \* CIRCLE WITH HORIZONTAL BAR [composed: U+25CB + U+0336]
- 5X06 TWO HORIZONTAL BARS IN CIRCLE
- 5X07 [removed: U+23DD]
- 5X08 \* B VERTICAL BAR IN CIRCLE
- 5X09 B PARALLEL IN CIRCLE

5X0A B REVERSE SOLIDUS IN CIRCLE  
5X0B B PERPENDICULAR IN CIRCLE  
5X0C CIRCLE, HORIZONTAL BAR, TOP DIVIDED BY VERTICAL  
5X0D CIRCLE, CROSS  
5X0E DOT, SOLIDUS, DOT IN CIRCLE  
5X0F CIRCLE WITH UP ARROW THROUGH IT  
5X10 LARGE CIRCLE IN CIRCLE [composed: U+25E6 + U+20DD]  
5X11 FILLED CIRCLE IN CIRCLE [composed: U+2219 + U+20DD]  
5X12 \* LESS-THAN IN CIRCLE  
5X13 \* GREATER-THAN IN CIRCLE  
5X14 CIRCLE, SMALL CIRCLE TO THE RIGHT  
5X15 CIRCLE, TWO HORIZONTAL STROKES TO THE RIGHT  
5X16 \* SOLIDUS IN SQUARE  
5X17 \* REVERSE SOLIDUS IN SQUARE  
5X18 ASTERISK IN BOX [composed: U+2217 + U+20DE]  
5X19 SMALL CIRCLE IN BOX [composed: U+2218 + U+20DE]  
5X1A B BOX WITHIN BOX [composed: U+25AB + U+20DE]  
5X1B TWO JOINED SQUARES  
5X20 TRIANGLE, DOT OVER [composed: U+25B3 + U+0307]  
5X21 \* TRIANGLE, BAR UNDER [composed: U+25B3 + U+0332]  
5X22 S IN TRIANGLE  
5X23 B TRIANGLE, SERIFS AT BOTTOM  
5X24 \* R NOT, VERTICAL, LEFT TRIANGLE, EQUALS [composed: U+22B4 + U+20D2]  
5X25 \* R NOT, VERTICAL, RIGHT TRIANGLE, EQUALS [composed: U+22B5 + U+20D2]  
5X26 R RIGHT TRIANGLE ABOVE LEFT TRIANGLE  
5X27 R LEFT TRIANGLE, VERTICAL BAR  
5X28 R VERTICAL BAR, RIGHT TRIANGLE  
5X29 R NOT LEFT TRIANGLE, VERTICAL BAR [composed: 5X27 + U+0338]  
5X2A R NOT VERTICAL BAR, RIGHT TRIANGLE [composed: 5X28 + U+0338]

## Bowtie, hourglass

5X30 R LEFT FILLED BOWTIE  
5X31 R RIGHT FILLED BOWTIE  
5X32 R FILLED BOWTIE  
5X33 R LEFT FILLED X (cf. U+22C9)  
5X34 R RIGHT FILLED X (cf. U+22CA)  
5X35 HOURGLASS PLUS (OPEN)  
5X36 FILLED HOURGLASS

## Miscellaneous relations

5X40 MOST POSITIVE  
5X41 CONGRUENCE SIGN (LAZY S)  
5X42 REVERSE MOST POSITIVE, LINE BELOW  
5X43 MOST POSITIVE, TWO LINES BELOW  
5X44 \* R PROPORTIONAL, VARIANT  
5X45 N INFINITY SIGN, INCOMPLETE  
5X46 N TIE, INFINITY  
5X47 N NOT, VERT, INFINITY  
5X48 R DOUBLE-ENDED VERSION OF MULTIMAP  
5X49 N D'ALEMBERTIAN (SQUARE WITH CONTOURED OUTLINE)

5X4A R INCREASES AS; WHITE LOWER RIGHT TRIANGLE OVER BAR \*\*\*  
 5X4B SHUFFLE PRODUCT  
 5X4C R PARALLEL, SLANTED, EQUAL; HOMOTHETICALLY CONGRUENT TO  
 5X4D R SIMILAR, PARALLEL, SLANTED, EQUAL [composed: 5X4C + U+0303]  
 5X4E R EQUIVALENT, EQUAL; CONGRUENT AND PARALLEL  
 5X4F R TOP ARC OVER BOTTOM ARC

\*\*\* 5X4A is composed of two parts: white lower right triangle (30/60/90 degrees), with bar below.

### Embellishments, diacritics, combining symbols

7X00 LOW ASTERISK  
 7X01 \* N QUADRUPLE PRIME [composed: U+2032 + U+2032 + U+2032 + U+2032]  
 7X02 D DOUBLE CIRCUMFLEX [composed: U+0302 + U+0302]  
 7X03 D DOUBLE TILDE [composed: U+0303 + U+0303]  
 7X04 D ACCENT CARET OVER DOT [composed: U+0307 + U+0302]  
 7X05 D DOUBLE DOT OVER BAR OVER [composed: U+0308 + U+0303]  
 7X06 D TILDE OVER BAR OVER [composed: U+0304 + U+0303]  
 7X07 D TRIPLE UNDERDOT  
 7X08 D TRIPLE UNDERBAR [composed: U+0332 + U+0332 + U+0332]  
 7X09 D QUADRUPLE UNDERBAR [composed: U+0332 + U+0332 + U+0332 + U+0332]  
 7X0A D STRAIGHT OVER WAVY UNDERLINE [composed: U+0331 + U+0330]  
 7X0B D WAVY OVER STRAIGHT UNDERLINE [composed: U+0330 + U+0331]  
 7X0C ANNUITY SYMBOL, ACTUARIAL BEND  
 7X0D D COMBINING REVERSE SOLIDUS OVERLAY (\$\$)

### Punctuation and similar

7X10 P HYPHEN  
 7X11 REVERSE SEMI-COLON  
 7X12 P EM LEADER  
 7X13 N TWO ASTERISKS, ALIGNED VERTICALLY  
 7X14 SOLIDUS, BAR ABOVE  
 7X15 REVERSED SOLIDUS, BAR THROUGH  
 7X16 BIG FORWARD SLASH  
 7X17 BIG BACKWARD SLASH  
 7X18 [removed: U+2572]  
 7X19 [removed: U+2571]  
 7X1A TOP SQUARE BRACKET  
 7X1B BOTTOM SQUARE BRACKET  
 7X1C BOTTOM ABOVE TOP SQUARE BRACKET  
 7X1D N TURNED AMPERSAND \*\*\*

\*\*\* 7x1D should be a turned ampersand (⌘), not an upside-down one.

### Miscellanea

7X20 SHORT HORIZONTAL LINE

7X21 N SIGNIFICANT BLANK SYMBOL  
 7X22 N ROUND SPACE INDICATOR  
 7X23 RULE-DELAYED (colon right arrow)  
 7X24 [removed: U+25AE]  
 7X25 N THERMODYNAMIC (vertical bar crossed by two horizontals)

## Geometric shapes

7X30 N DOWN-POINTING TRIANGLE WITH LEFT HALF BLACK  
 7X31 N DOWN-POINTING TRIANGLE WITH RIGHT HALF BLACK  
 7X32 UPPER LEFT TRIANGLE  
 7X33 UPPER RIGHT TRIANGLE  
 7X34 LOWER LEFT TRIANGLE  
 7X35 [removed: U+25E3]  
 7X36 [removed: U+25E5]  
 7X37 N LARGE WHITE SQUARE  
 7X38 N LARGE FILLED SQUARE  
 7X39 [removed: 7X38]  
 7X3A N EMPTY SMALL SQUARE  
 7X3B N FILLED SMALL SQUARE  
 7X3C N EMPTY VERY SMALL SQUARE  
 7X3D N FILLED VERY SMALL SQUARE  
 7X3E N WHITE DIAMOND WITH CENTERED DOT  
 7X3F N FILLED DIAMOND WITH DOWN ARROW  
 7X40 LOZENGE, FILLED  
 7X41 N TRAPEZIUM  
 7X42 N SEXTILE (6-POINTED STAR)  
 7X43 N CIRCLE WITH DOWN ARROW  
 7X44 N FILLED CIRCLE WITH DOWN ARROW  
 7X45 N ERROR-BARRED WHITE SQUARE  
 7X46 N ERROR-BARRED FILLED SQUARE  
 7X47 N ERROR-BARRED WHITE DIAMOND  
 7X48 N ERROR-BARRED FILLED DIAMOND  
 7X49 N ERROR-BARRED WHITE CIRCLE  
 7X4A N ERROR-BARRED FILLED CIRCLE

## References

International Organization for Standardization, ISO 31/XI-1992. Mathematical signs and symbols for use in the physical sciences and technology, 2nd edition, 1992. (by ref. in ANSI/IEEE P1324)

American Society of Mechanical Engineers, ANSI Y10.20-1975. Mathematical signs and symbols for use in physical sciences and technology, 1975.

Institute of Electrical and Electronics Engineers, ANSI/IEEE P1324 (draft revision of Y10.20), Draft standard mathematical signs and symbols for use in physical sciences and technology, 1992.