

Supplemental Mathematical Operators

Range: 2A00–2AFF

This file contains an excerpt from the character code tables and list of character names for *The Unicode Standard, Version 5.2*.

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See <http://www.unicode.org/charts/> for access to a complete list of the latest character code charts. See <http://www.unicode.org/charts/PDF/Unicode-5.2/> for charts showing only the characters added in Unicode 5.2. See <http://www.unicode.org/Public/5.2.0/charts/> for a complete archived file of character code charts for Unicode 5.2.

Disclaimer

These charts are provided as the online reference to the character contents of the Unicode Standard, Version 5.2 but do not provide all the information needed to fully support individual scripts using the Unicode Standard. For a complete understanding of the use of the characters contained in this file, please consult the appropriate sections of *The Unicode Standard, Version 5.2*, online at <http://www.unicode.org/versions/Unicode5.2.0/>, as well as Unicode Standard Annexes #9, #11, #14, #15, #24, #29, #31, #34, #38, #41, #42, and #44, the other Unicode Technical Reports and Standards, and the Unicode Character Database, which are available online.

See <http://www.unicode.org/ucd/> and <http://www.unicode.org/reports/>

A thorough understanding of the information contained in these additional sources is required for a successful implementation.

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See <http://www.unicode.org/pending/pending.html> and <http://www.unicode.org/alloc/Pipeline.html>.

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	2A00	2A01	2A02	2A03	2A04	2A05	2A06	2A07	2A08	2A09	2AA0	2AB0	2AC0	2AD0	2AE0	2AF0
0																
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9																
A																
B																
C																
D																
E																
F																

N-ary operators

- 2A00 \odot N-ARY CIRCLED DOT OPERATOR
→ 2299 \odot circled dot operator
→ 25C9 \odot fisheye
- 2A01 \oplus N-ARY CIRCLED PLUS OPERATOR
→ 2295 \oplus circled plus
- 2A02 \otimes N-ARY CIRCLED TIMES OPERATOR
→ 2297 \otimes circled times
→ 2B59 \otimes heavy circled saltire
- 2A03 \cup N-ARY UNION OPERATOR WITH DOT
- 2A04 \cup N-ARY UNION OPERATOR WITH PLUS
→ 228E \cup multiset union
- 2A05 \sqcap N-ARY SQUARE INTERSECTION OPERATOR
→ 2293 \sqcap square cap
- 2A06 \sqcup N-ARY SQUARE UNION OPERATOR
→ 2294 \sqcup square cup
- 2A07 \pitchfork TWO LOGICAL AND OPERATOR
= merge
→ 2A55 \pitchfork two intersecting logical and
- 2A08 \vee TWO LOGICAL OR OPERATOR
→ 2A56 \vee two intersecting logical or
- 2A09 \times N-ARY TIMES OPERATOR
→ 00D7 \times multiplication sign

Summations and integrals

- 2A0A \sum_2 MODULO TWO SUM
→ 2211 \sum n-ary summation
- 2A0B \int SUMMATION WITH INTEGRAL
- 2A0C \iiint QUADRUPLE INTEGRAL OPERATOR
→ 222D \iiint triple integral
≈ 222B \int 222B \int 222B \int 222B \int
- 2A0D \int FINITE PART INTEGRAL
- 2A0E \int INTEGRAL WITH DOUBLE STROKE
- 2A0F \int INTEGRAL AVERAGE WITH SLASH
- 2A10 \int CIRCULATION FUNCTION
- 2A11 \int ANTICLOCKWISE INTEGRATION
- 2A12 \int LINE INTEGRATION WITH RECTANGULAR PATH AROUND POLE
- 2A13 \int LINE INTEGRATION WITH SEMICIRCULAR PATH AROUND POLE
- 2A14 \int LINE INTEGRATION NOT INCLUDING THE POLE
- 2A15 \oint INTEGRAL AROUND A POINT OPERATOR
→ 222E \oint contour integral
- 2A16 \int QUATERNION INTEGRAL OPERATOR
- 2A17 \int INTEGRAL WITH LEFTWARDS ARROW WITH HOOK
- 2A18 \int INTEGRAL WITH TIMES SIGN
- 2A19 \int INTEGRAL WITH INTERSECTION
- 2A1A \int INTEGRAL WITH UNION
- 2A1B \int INTEGRAL WITH OVERBAR
= upper integral
- 2A1C \int INTEGRAL WITH UNDERBAR
= lower integral

Miscellaneous large operators

- 2A1D \bowtie JOIN
= large bowtie
• relational database theory
→ 22C8 \bowtie bowtie
→ 27D7 \bowtie full outer join
- 2A1E \triangleleft LARGE LEFT TRIANGLE OPERATOR
• relational database theory
→ 25C1 \triangleleft white left-pointing triangle

- 2A1F ζ Z NOTATION SCHEMA COMPOSITION
→ 2A3E ζ z notation relational composition
- 2A20 \gg Z NOTATION SCHEMA PIPING
→ 226B \gg much greater-than
- 2A21 \uparrow Z NOTATION SCHEMA PROJECTION
→ 21BE \uparrow upwards harpoon with barb rightwards

Plus and minus sign operators

- 2A22 \plus PLUS SIGN WITH SMALL CIRCLE ABOVE
- 2A23 \plus PLUS SIGN WITH CIRCUMFLEX ACCENT ABOVE
- 2A24 \plus PLUS SIGN WITH TILDE ABOVE
= positive difference or sum
- 2A25 \plus PLUS SIGN WITH DOT BELOW
→ 2214 \plus dot plus
- 2A26 \plus PLUS SIGN WITH TILDE BELOW
= sum or positive difference
- 2A27 \plus PLUS SIGN WITH SUBSCRIPT TWO
= nim-addition
- 2A28 \plus PLUS SIGN WITH BLACK TRIANGLE
- 2A29 \minus MINUS SIGN WITH COMMA ABOVE
- 2A2A \minus MINUS SIGN WITH DOT BELOW
→ 2238 \minus dot minus
- 2A2B \minus MINUS SIGN WITH FALLING DOTS
- 2A2C \minus MINUS SIGN WITH RISING DOTS
- 2A2D \oplus PLUS SIGN IN LEFT HALF CIRCLE
- 2A2E \oplus PLUS SIGN IN RIGHT HALF CIRCLE

Multiplication and division sign operators

- 2A2F \times VECTOR OR CROSS PRODUCT
→ 00D7 \times multiplication sign
- 2A30 \times MULTIPLICATION SIGN WITH DOT ABOVE
- 2A31 \times MULTIPLICATION SIGN WITH UNDERBAR
- 2A32 \times SEMIDIRECT PRODUCT WITH BOTTOM CLOSED
- 2A33 \times SMASH PRODUCT
- 2A34 \times MULTIPLICATION SIGN IN LEFT HALF CIRCLE
- 2A35 \times MULTIPLICATION SIGN IN RIGHT HALF CIRCLE
- 2A36 \otimes CIRCLED MULTIPLICATION SIGN WITH CIRCUMFLEX ACCENT
- 2A37 \otimes MULTIPLICATION SIGN IN DOUBLE CIRCLE
- 2A38 \oslash CIRCLED DIVISION SIGN

Miscellaneous mathematical operators

- 2A39 \triangle PLUS SIGN IN TRIANGLE
- 2A3A \triangle MINUS SIGN IN TRIANGLE
- 2A3B \triangle MULTIPLICATION SIGN IN TRIANGLE
- 2A3C \dashv INTERIOR PRODUCT
→ 230B \dashv right floor
- 2A3D \dashv RIGHTHAND INTERIOR PRODUCT
→ 230A \dashv left floor
→ 2319 \dashv turned not sign
- 2A3E ζ Z NOTATION RELATIONAL COMPOSITION
→ 2A1F ζ z notation schema composition
- 2A3F \sqcup AMALGAMATION OR COPRODUCT
→ 2210 \sqcup n-ary coproduct

Intersections and unions

- 2A40 \cap INTERSECTION WITH DOT
→ 2227 \cap logical and
→ 27D1 \cap and with dot
- 2A41 \cup UNION WITH MINUS SIGN
= z notation bag subtraction
→ 228E \cup multiset union
- 2A42 $\bar{\cup}$ UNION WITH OVERBAR
- 2A43 $\bar{\cap}$ INTERSECTION WITH OVERBAR

2A91	≡	LESS-THAN ABOVE GREATER-THAN ABOVE DOUBLE-LINE EQUAL
2A92	≡	GREATER-THAN ABOVE LESS-THAN ABOVE DOUBLE-LINE EQUAL
2A93	≡	LESS-THAN ABOVE SLANTED EQUAL ABOVE GREATER-THAN ABOVE SLANTED EQUAL
2A94	≡	GREATER-THAN ABOVE SLANTED EQUAL ABOVE LESS-THAN ABOVE SLANTED EQUAL
2A95	≡	SLANTED EQUAL TO OR LESS-THAN → 22DC ≡ equal to or less-than
2A96	≡	SLANTED EQUAL TO OR GREATER-THAN → 22DD ≡ equal to or greater-than
2A97	≡	SLANTED EQUAL TO OR LESS-THAN WITH DOT INSIDE
2A98	≡	SLANTED EQUAL TO OR GREATER-THAN WITH DOT INSIDE
2A99	≡	DOUBLE-LINE EQUAL TO OR LESS-THAN → 22DC ≡ equal to or less-than
2A9A	≡	DOUBLE-LINE EQUAL TO OR GREATER-THAN → 22DD ≡ equal to or greater-than
2A9B	≡	DOUBLE-LINE SLANTED EQUAL TO OR LESS-THAN
2A9C	≡	DOUBLE-LINE SLANTED EQUAL TO OR GREATER-THAN
2A9D	≡	SIMILAR OR LESS-THAN
2A9E	≡	SIMILAR OR GREATER-THAN
2A9F	≡	SIMILAR ABOVE LESS-THAN ABOVE EQUALS SIGN
2AA0	≡	SIMILAR ABOVE GREATER-THAN ABOVE EQUALS SIGN
2AA1	≡	DOUBLE NESTED LESS-THAN = absolute continuity → 226A ≡ much less-than
2AA2	≡	DOUBLE NESTED GREATER-THAN → 226B ≡ much greater-than
2AA3	≡	DOUBLE NESTED LESS-THAN WITH UNDERBAR
2AA4	≡	GREATER-THAN OVERLAPPING LESS-THAN
2AA5	≡	GREATER-THAN BESIDE LESS-THAN
2AA6	≡	LESS-THAN CLOSED BY CURVE
2AA7	≡	GREATER-THAN CLOSED BY CURVE
2AA8	≡	LESS-THAN CLOSED BY CURVE ABOVE SLANTED EQUAL
2AA9	≡	GREATER-THAN CLOSED BY CURVE ABOVE SLANTED EQUAL
2AAA	≡	SMALLER THAN
2AAB	≡	LARGER THAN
2AAC	≡	SMALLER THAN OR EQUAL TO
2AAD	≡	LARGER THAN OR EQUAL TO
2AAE	≡	EQUALS SIGN WITH BUMPY ABOVE → 224F ≡ difference between
2AAF	≡	PRECEDES ABOVE SINGLE-LINE EQUALS SIGN → 227C ≡ precedes or equal to
2AB0	≡	SUCCEEDS ABOVE SINGLE-LINE EQUALS SIGN → 227D ≡ succeeds or equal to
2AB1	≡	PRECEDES ABOVE SINGLE-LINE NOT EQUAL TO
2AB2	≡	SUCCEEDS ABOVE SINGLE-LINE NOT EQUAL TO
2AB3	≡	PRECEDES ABOVE EQUALS SIGN
2AB4	≡	SUCCEEDS ABOVE EQUALS SIGN
2AB5	≡	PRECEDES ABOVE NOT EQUAL TO
2AB6	≡	SUCCEEDS ABOVE NOT EQUAL TO
2AB7	≡	PRECEDES ABOVE ALMOST EQUAL TO
2AB8	≡	SUCCEEDS ABOVE ALMOST EQUAL TO
2AB9	≡	PRECEDES ABOVE NOT ALMOST EQUAL TO

2ABA	≡	SUCCEEDS ABOVE NOT ALMOST EQUAL TO
2ABB	≡	DOUBLE PRECEDES
2ABC	≡	DOUBLE SUCCEEDS

Subset and superset relations

2ABD	≡	SUBSET WITH DOT
2ABE	≡	SUPERSET WITH DOT
2ABF	≡	SUBSET WITH PLUS SIGN BELOW
2AC0	≡	SUPERSET WITH PLUS SIGN BELOW
2AC1	≡	SUBSET WITH MULTIPLICATION SIGN BELOW
2AC2	≡	SUPERSET WITH MULTIPLICATION SIGN BELOW
2AC3	≡	SUBSET OF OR EQUAL TO WITH DOT ABOVE
2AC4	≡	SUPERSET OF OR EQUAL TO WITH DOT ABOVE
2AC5	≡	SUBSET OF ABOVE EQUALS SIGN
2AC6	≡	SUPERSET OF ABOVE EQUALS SIGN
2AC7	≡	SUBSET OF ABOVE TILDE OPERATOR
2AC8	≡	SUPERSET OF ABOVE TILDE OPERATOR
2AC9	≡	SUBSET OF ABOVE ALMOST EQUAL TO
2ACA	≡	SUPERSET OF ABOVE ALMOST EQUAL TO
2ACB	≡	SUBSET OF ABOVE NOT EQUAL TO
2ACC	≡	SUPERSET OF ABOVE NOT EQUAL TO
2ACD	≡	SQUARE LEFT OPEN BOX OPERATOR
2ACE	≡	SQUARE RIGHT OPEN BOX OPERATOR
2ACF	≡	CLOSED SUBSET → 2282 ≡ subset of
2AD0	≡	CLOSED SUPERSET → 2283 ≡ superset of
2AD1	≡	CLOSED SUBSET OR EQUAL TO
2AD2	≡	CLOSED SUPERSET OR EQUAL TO
2AD3	≡	SUBSET ABOVE SUPERSET
2AD4	≡	SUPERSET ABOVE SUBSET
2AD5	≡	SUBSET ABOVE SUBSET
2AD6	≡	SUPERSET ABOVE SUPERSET
2AD7	≡	SUPERSET BESIDE SUBSET
2AD8	≡	SUPERSET BESIDE AND JOINED BY DASH WITH SUBSET

Forks

2AD9	≡	ELEMENT OF OPENING DOWNWARDS → 2208 ≡ element of → 27D2 ≡ element of opening upwards
2ADA	≡	PITCHFORK WITH TEE TOP → 22D4 ≡ pitchfork
2ADB	≡	TRANSVERSAL INTERSECTION → 22D4 ≡ pitchfork
2ADC	≡	FORKING = not independent • an equational logic symbol, not a computing science symbol • non-independence (original concept) is related to forking ≡ 2ADD ≡ 0338 ≠
2ADD	≡	NONFORKING = independent • an equational logic symbol, not a computing science symbol • independence (original concept) is related to non-forking

Tacks and turnstiles

2ADE	≡	SHORT LEFT TACK → 22A3 ≡ left tack
2ADF	≡	SHORT DOWN TACK → 22A4 ≡ down tack

2AE0	\perp	SHORT UP TACK → 22A5 \perp up tack
2AE1	$\perp\!\!\!\perp$	PERPENDICULAR WITH S
2AE2	\equiv	VERTICAL BAR TRIPLE RIGHT TURNSTILE = ordinarily satisfies
2AE3	\dashv	DOUBLE VERTICAL BAR LEFT TURNSTILE → 22A9 \dashv forces
2AE4	\Leftrightarrow	VERTICAL BAR DOUBLE LEFT TURNSTILE → 22A8 \Leftrightarrow true
2AE5	$\Leftrightarrow\!\!\!\Leftrightarrow$	DOUBLE VERTICAL BAR DOUBLE LEFT TURNSTILE
2AE6	\Vdash	LONG DASH FROM LEFT MEMBER OF DOUBLE VERTICAL → 22A9 \Vdash forces
2AE7	$\overline{\dashv}$	SHORT DOWN TACK WITH OVERBAR → 22A4 $\overline{\dashv}$ down tack → 2351 $\overline{\dashv}$ apl functional symbol up tack overbar
2AE8	$\underline{\perp}$	SHORT UP TACK WITH UNDERBAR → 22A5 $\underline{\perp}$ up tack → 234A $\underline{\perp}$ apl functional symbol down tack underbar
2AE9	$\overline{\dashv}\!\!\!\overline{\dashv}$	SHORT UP TACK ABOVE SHORT DOWN TACK
2AEA	\Uparrow	DOUBLE DOWN TACK
2AEB	$\perp\!\!\!\perp$	DOUBLE UP TACK = independence • probability theory
2AEC	\Rightarrow	DOUBLE STROKE NOT SIGN → 00AC \Rightarrow not sign
2AED	\Leftarrow	REVERSED DOUBLE STROKE NOT SIGN → 2310 \Leftarrow reversed not sign

Vertical line operators

2AEE	\nmid	DOES NOT DIVIDE WITH REVERSED NEGATION SLASH → 2224 \nmid does not divide
2AEF	\upharpoonright	VERTICAL LINE WITH CIRCLE ABOVE
2AF0	\downharpoonright	VERTICAL LINE WITH CIRCLE BELOW
2AF1	\downdownarrows	DOWN TACK WITH CIRCLE BELOW = necessarily satisfies → 27DF \downdownarrows up tack with circle above
2AF2	\nparallel	PARALLEL WITH HORIZONTAL STROKE → 2226 \nparallel not parallel to → 27CA \nparallel vertical bar with horizontal stroke
2AF3	\nTilde	PARALLEL WITH TILDE OPERATOR
2AF4	$\equiv\!\!\!\equiv$	TRIPLE VERTICAL BAR BINARY RELATION = interleave → 2980 $\equiv\!\!\!\equiv$ triple vertical bar delimiter
2AF5	$\equiv\!\!\!\equiv\!\!\!\equiv$	TRIPLE VERTICAL BAR WITH HORIZONTAL STROKE → 27CA $\equiv\!\!\!\equiv\!\!\!\equiv$ vertical bar with horizontal stroke

Miscellaneous mathematical operator

2AF6	\vdots	TRIPLE COLON OPERATOR • logic → 205D \vdots tricolon → 22EE \vdots vertical ellipsis
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Relations

2AF7	\lll	TRIPLE NESTED LESS-THAN → 22D8 \lll very much less-than
2AF8	\ggg	TRIPLE NESTED GREATER-THAN → 22D9 \ggg very much greater-than
2AF9	\gtrsim	DOUBLE-LINE SLANTED LESS-THAN OR EQUAL TO → 2266 \gtrsim less-than over equal to

2AFA	\gtrsim	DOUBLE-LINE SLANTED GREATER-THAN OR EQUAL TO → 2267 \gtrsim greater-than over equal to
2AFB	$\equiv\!\!\!\equiv$	TRIPLE SOLIDUS BINARY RELATION → 2AF4 $\equiv\!\!\!\equiv$ triple vertical bar binary relation

Operators

2AFC	$\equiv\!\!\!\equiv\!\!\!\equiv$	LARGE TRIPLE VERTICAL BAR OPERATOR • often n-ary → 2AF4 $\equiv\!\!\!\equiv\!\!\!\equiv$ triple vertical bar binary relation → 2980 $\equiv\!\!\!\equiv\!\!\!\equiv$ triple vertical bar delimiter
2AFD	\parallel	DOUBLE SOLIDUS OPERATOR → 2225 \parallel parallel to
2AFE	$\ $	WHITE VERTICAL BAR = Dijkstra choice
2AFF	$\ $	N-ARY WHITE VERTICAL BAR = n-ary Dijkstra choice