

Mathematical Operators

Range: 2200–22FF

The Unicode Standard, Version 15.1

This file contains an excerpt from the character code tables and list of character names for *The Unicode Standard, Version 15.1*

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See <https://www.unicode.org/charts/> for access to a complete list of the latest character code charts. See <https://www.unicode.org/charts/PDF/Unicode-15.1/> for charts showing only the characters added in Unicode 15.1. See <https://www.unicode.org/Public/15.1.0/charts/> for a complete archived file of character code charts for Unicode 15.1. See <https://www.unicode.org/charts/About.html#Conventions> for conventions used in these code charts, and other general information.

Disclaimer

These charts are provided as the online reference to the character contents of the Unicode Standard, Version 15.1 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 15.1, online at <https://www.unicode.org/versions/Unicode15.1.0/>, as well as Unicode Standard Annexes #9, #11, #14, #15, #24, #29, #31, #34, #38, #41, #42, #44, #45, and #50, the other Unicode Technical Reports and Standards, and the Unicode Character Database, which are available online.

See <https://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 <https://www.unicode.org/charts/fonts.html> for a list.

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

See <https://www.unicode.org/charts/About.html> for more information concerning the conventions and symbols used in these code charts.

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	220	221	222	223	224	225	226	227	228	229	22A	22B	22C	22D	22E	22F
0	∇ 2200	\sqcup 2210	\angle 2220	$\rlap{-}\int$ 2230	ζ 2240	\doteq 2250	\neq 2260	$\not\approx$ 2270	$\not\propto$ 2280	\sqsupset 2290	\boxtimes 22A0	\wp 22B0	\bigwedge 22C0	\in 22D0	$\not\in$ 22E0	\ddots 22F0
1	\complement 2201	\sum 2211	\triangleleft 2221	\int 2231	\approx 2241	\doteq 2251	\equiv 2261	$\not\approx$ 2271	$\not\propto$ 2281	\sqsubseteq 2291	\boxdot 22A1	\wp 22B1	\bigvee 22C1	\supset 22D1	$\not\in$ 22E1	\ddots 22F1
2	∂ 2202	$-$ 2212	\triangleleft 2222	\int 2232	\approx 2242	\doteq 2252	\neq 2262	\lesssim 2272	\subset 2282	\sqsubseteq 2292	\dashv 22A2	\triangleleft 22B2	\cap 22C2	\supset 22D2	$\not\in$ 22E2	\in 22F2
3	\exists 2203	\mp 2213	$ $ 2223	\int 2233	\approx 2243	\doteq 2253	\equiv 2263	\lesssim 2273	\supset 2283	\sqsupset 2293	\dashv 22A3	\triangleleft 22B3	\cup 22C3	\supset 22D3	$\not\in$ 22E3	\in 22F3
4	\nexists 2204	$\dot{+}$ 2214	\dagger 2224	\ddots 2234	$\not\approx$ 2244	\doteq 2254	\leq 2264	$\not\approx$ 2274	$\not\propto$ 2284	\sqsupset 2294	\top 22A4	\triangleleft 22B4	\diamond 22C4	\supset 22D4	\sqsupset 22E4	\in 22F4
5	\emptyset 2205	$/$ 2215	\parallel 2225	\ddots 2235	\approx 2245	\doteq 2255	\geq 2265	$\not\approx$ 2275	$\not\propto$ 2285	\oplus 2295	\top 22A5	\triangleleft 22B5	\cdot 22C5	$\#$ 22D5	\sqsupset 22E5	\in 22F5
6	\triangle 2206	\setminus 2216	$\#$ 2226	\cdot 2236	\approx 2246	\doteq 2256	\leq 2266	\geq 2276	\subset 2286	\ominus 2296	\dashv 22A6	\circ 22B6	\star 22C6	\triangleleft 22D6	\lesssim 22E6	\in 22F6
7	∇ 2207	$*$ 2217	\wedge 2227	\ddots 2237	$\not\approx$ 2247	\doteq 2257	\geq 2267	\geq 2277	\supset 2287	\otimes 2297	\dashv 22A7	\circ 22B7	$*$ 22C7	\triangleleft 22D7	\lesssim 22E7	\in 22F7
8	\in 2208	\circ 2218	\vee 2228	$\dot{-}$ 2238	\approx 2248	\doteq 2258	\neq 2268	$\not\approx$ 2278	$\not\propto$ 2288	\ominus 2298	\dashv 22A8	\circ 22B8	\otimes 22C8	\lll 22D8	\lesssim 22E8	\in 22F8
9	\notin 2209	\cdot 2219	\cap 2229	$\dot{-}$ 2239	$\not\approx$ 2249	\doteq 2259	\neq 2269	$\not\approx$ 2279	$\not\propto$ 2289	\odot 2299	\dashv 22A9	$\dot{+}$ 22B9	\otimes 22C9	\lll 22D9	\lesssim 22E9	\in 22F9
A	ϵ 220A	$\sqrt{\quad}$ 221A	\cup 222A	\ddots 223A	\approx 224A	\doteq 225A	\lll 226A	\lrcorner 227A	\complement 228A	\odot 229A	\dashv 22AA	\top 22BA	\otimes 22CA	\lll 22DA	$\not\in$ 22EA	\in 22FA
B	\ni 220B	$\sqrt[3]{\quad}$ 221B	\int 222B	\approx 223B	\approx 224B	\doteq 225B	\lll 226B	\lrcorner 227B	\complement 228B	\otimes 229B	\dashv 22AB	\vee 22BB	\wedge 22CB	\lll 22DB	$\not\in$ 22EB	\in 22FB
C	$\not\in$ 220C	$\sqrt[4]{\quad}$ 221C	\iint 222C	\approx 223C	\approx 224C	\doteq 225C	$\not\approx$ 226C	\lrcorner 227C	\in 228C	\ominus 229C	$\not\approx$ 22AC	\wedge 22BC	\wedge 22CC	\leq 22DC	$\not\in$ 22EC	\in 22FC
D	\ni 220D	α 221D	\iiint 222D	\approx 223D	\approx 224D	\doteq 225D	$\not\approx$ 226D	\lrcorner 227D	\in 228D	\ominus 229D	$\not\approx$ 22AD	∇ 22BD	\approx 22CD	\leq 22DD	$\not\in$ 22ED	\in 22FD
E	\blacksquare 220E	∞ 221E	\int 222E	\approx 223E	\approx 224E	\doteq 225E	$\not\approx$ 226E	\lesssim 227E	\in 228E	\boxplus 229E	$\not\approx$ 22AE	\dashv 22BE	\vee 22CE	\approx 22DE	\ddots 22EE	\in 22FE
F	\prod 220F	\llcorner 221F	$\rlap{-}\int$ 222F	\approx 223F	\approx 224F	\doteq 225F	$\not\approx$ 226F	\lesssim 227F	\sqsupset 228F	\boxplus 229F	$\not\approx$ 22AF	\triangleleft 22BF	\wedge 22CF	\approx 22DF	\ddots 22EF	\in 22FF

Miscellaneous mathematical symbols

- 2200 \forall FOR ALL
= universal quantifier
- 2201 \complement COMPLEMENT
→ 0297 \complement latin letter stretched c
- 2202 ∂ PARTIAL DIFFERENTIAL
- 2203 \exists THERE EXISTS
= existential quantifier
- 2204 \nexists THERE DOES NOT EXIST
≡ 2203 \exists 0338 $\not\exists$
- 2205 \emptyset EMPTY SET
= null set
• used in linguistics to indicate a null morpheme or phonological “zero”
→ 00D8 \emptyset latin capital letter o with stroke
→ 2300 \emptyset diameter sign
~ 2205 FE00 \emptyset zero with long diagonal stroke overlay form
- 2206 Δ INCREMENT
= Laplace operator
= forward difference
= symmetric difference (in set theory)
• other symbols may also be used for symmetric difference
→ 0394 Δ greek capital letter delta
→ 25B3 Δ white up-pointing triangle
- 2207 ∇ NABLA
= backward difference
= gradient, del
• used for Laplacian operator (written with superscript 2)
→ 25BD ∇ white down-pointing triangle

Set membership

- 2208 \in ELEMENT OF
- 2209 \notin NOT AN ELEMENT OF
≡ 2208 \in 0338 $\not\in$
- 220A ϵ SMALL ELEMENT OF
• originates in math pi fonts; not the straight epsilon
→ 03F5 ϵ greek lunate epsilon symbol
- 220B \ni CONTAINS AS MEMBER
= such that
- 220C $\not\ni$ DOES NOT CONTAIN AS MEMBER
≡ 220B \ni 0338 $\not\ni$
- 220D \ni SMALL CONTAINS AS MEMBER
→ 03F6 \ni greek reversed lunate epsilon symbol

Miscellaneous mathematical symbol

- 220E \blacksquare END OF PROOF
= q.e.d.
→ 2023 \blacktriangleright triangular bullet
→ 25AE \blacksquare black vertical rectangle

N-ary operators

- 220F \prod N-ARY PRODUCT
= product sign
→ 03A0 \prod greek capital letter pi
- 2210 \coprod N-ARY COPRODUCT
= coproduct sign
- 2211 \sum N-ARY SUMMATION
= summation sign
→ 03A3 \sum greek capital letter sigma
→ 2140 $\sum\limits$ double-struck n-ary summation

Operators

- 2212 $-$ MINUS SIGN
→ 002D $-$ hyphen-minus
→ 2796 — heavy minus sign
- 2213 \mp MINUS-OR-PLUS SIGN
→ 00B1 \pm plus-minus sign
- 2214 \dagger DOT PLUS
- 2215 $/$ DIVISION SLASH
• generic division operator
→ 002F $/$ solidus
→ 2044 $/$ fraction slash
→ 27CB $/$ mathematical rising diagonal
- 2216 \setminus SET MINUS
→ 005C \setminus reverse solidus
→ 27CD \setminus mathematical falling diagonal
→ 29F5 \setminus reverse solidus operator
- 2217 $*$ ASTERISK OPERATOR
→ 002A $*$ asterisk
- 2218 \circ RING OPERATOR
= composite function
= APL jot
→ 00B0 $^\circ$ degree sign
→ 0970 $^\circ$ devanagari abbreviation sign
→ 25E6 \bullet white bullet
→ 10B39 $^\circ$ avestan abbreviation mark
- 2219 \cdot BULLET OPERATOR
→ 00B7 \cdot middle dot
→ 2022 \bullet bullet
→ 2024 \cdot one dot leader
- 221A $\sqrt{\quad}$ SQUARE ROOT
= radical sign
→ 2713 \checkmark check mark
- 221B $\sqrt[3]{\quad}$ CUBE ROOT
→ 0606 $\sqrt[3]{\quad}$ arabic-indic cube root
- 221C $\sqrt[4]{\quad}$ FOURTH ROOT
→ 0607 $\sqrt[4]{\quad}$ arabic-indic fourth root
- 221D \propto PROPORTIONAL TO
→ 03B1 α greek small letter alpha

Miscellaneous mathematical symbol

- 221E ∞ INFINITY

Angles

Other angle symbols are found at 299B-29AF.

- 221F \perp RIGHT ANGLE
= with (in chess notation)
→ 2BFE \perp reversed right angle
- 2220 \sphericalangle ANGLE
• used in astrological contexts for aspect semisquare
→ 299F \sphericalangle acute angle
- 2221 \sphericalangle MEASURED ANGLE
- 2222 \sphericalangle SPHERICAL ANGLE
= angle arc

Relations

- 2223 $|$ DIVIDES
= such that
= APL stile
→ 007C $|$ vertical line
→ 01C0 $|$ latin letter dental click
- 2224 \nmid DOES NOT DIVIDE
≡ 2223 $|$ 0338 $\not\mid$

- 2225 || PARALLEL TO
 → 01C1 || latin letter lateral click
 → 2016 || double vertical line
- 2226 † NOT PARALLEL TO
 ≡ 2225 || 0338 †

Logical and set operators

- 2227 ^ LOGICAL AND
 = wedge, conjunction
 → 22C0 ^ n-ary logical and
 → 2303 ^ up arrowhead
 → 27D1 A and with dot
- 2228 v LOGICAL OR
 = vee, disjunction
 → 22C1 v n-ary logical or
 → 2304 v down arrowhead
 → 27C7 v or with dot inside
- 2229 ∩ INTERSECTION
 = cap, hat
 → 22C2 ∩ n-ary intersection
 ~ 2229 FE00 ∩ with serifs
- 222A ∪ UNION
 = cup
 → 22C3 ∪ n-ary union
 ~ 222A FE00 ∪ with serifs

Integrals

- 222B ∫ INTEGRAL
 → 0283 ∫ latin small letter esh
- 222C ∬ DOUBLE INTEGRAL
 ≈ 222B ∫ 222B ∫
- 222D ∭ TRIPLE INTEGRAL
 → 2A0C ∭ quadruple integral operator
 ≈ 222B ∫ 222B ∫ 222B ∫
- 222E ∮ CONTOUR INTEGRAL
 → 2A15 ∮ integral around a point operator
- 222F ∯ SURFACE INTEGRAL
 ≈ 222E ∮ 222E ∮
- 2230 ∭ VOLUME INTEGRAL
 ≈ 222E ∮ 222E ∮ 222E ∮
- 2231 ∫ CLOCKWISE INTEGRAL
- 2232 ∮ CLOCKWISE CONTOUR INTEGRAL
- 2233 ∮ ANTICLOCKWISE CONTOUR INTEGRAL
 • clockwise or anticlockwise arrows do not reverse during layout mirroring

Miscellaneous mathematical symbols

- 2234 ∴ THEREFORE
 → 26EC ∴ historic site
- 2235 ∵ BECAUSE

Relations

- 2236 ∴ RATIO
 • preferred to 003A ∴ for denotation of division or scale in mathematical use
 → 003A ∴ colon
- 2237 ∵ PROPORTION

Operator

- 2238 ∸ DOT MINUS
 = saturating subtraction
 • sometimes claimed as notation for symmetric set difference, but 2206 Δ is preferred

Relation

- 2239 ∺ EXCESS

Operator

- 223A ∷ GEOMETRIC PROPORTION

Relations

- 223B ∽ HOMOTHETIC
 → 2A6B ∽ tilde operator with rising dots
- 223C ∼ TILDE OPERATOR
 = varies with (proportional to)
 = difference between
 = similar to
 = not
 = cycle
 = APL tilde
 → 007E ∼ tilde
 → 00AC ∼ not sign
 → 02DC ∼ small tilde
- 223D ∷ REVERSED TILDE
 = lazy S
 • reversed tilde and lazy S are glyph variants
- 223E ∽ INVERTED LAZY S
 = most positive

Miscellaneous mathematical symbol

- 223F ∼ SINE WAVE
 = alternating current

Operator

- 2240 ∷ WREATH PRODUCT

Relations

- 2241 ∽ NOT TILDE
 ≡ 223C ∼ 0338 †
- 2242 ≈ MINUS TILDE
- 2243 ≈ ASYMPTOTICALLY EQUAL TO
- 2244 ≠ NOT ASYMPTOTICALLY EQUAL TO
 ≡ 2243 ≈ 0338 †
- 2245 ≈ APPROXIMATELY EQUAL TO
 → 2A70 ≈ approximately equal or equal to
- 2246 ≈ APPROXIMATELY BUT NOT ACTUALLY EQUAL TO
- 2247 ≠ NEITHER APPROXIMATELY NOR ACTUALLY EQUAL TO
 ≡ 2245 ≈ 0338 †
- 2248 ≈ ALMOST EQUAL TO
 = asymptotic to
- 2249 ≈ NOT ALMOST EQUAL TO
 ≡ 2248 ≈ 0338 †
- 224A ≈ ALMOST EQUAL OR EQUAL TO
- 224B ≈ TRIPLE TILDE
- 224C ≡ ALL EQUAL TO
 • reversed tilde and lazy S are glyph variants
- 224D × EQUIVALENT TO
- 224E ⇔ GEOMETRICALLY EQUIVALENT TO
- 224F ≡ DIFFERENCE BETWEEN
- 2250 ≐ APPROACHES THE LIMIT
- 2251 ≐ GEOMETRICALLY EQUAL TO
- 2252 ≐ APPROXIMATELY EQUAL TO OR THE IMAGE OF
 = nearly equals
- 2253 ≐ IMAGE OF OR APPROXIMATELY EQUAL TO
- 2254 ≐ COLON EQUALS
- 2255 ≐ EQUALS COLON
- 2256 ≐ RING IN EQUAL TO
- 2257 ≐ RING EQUAL TO
 = approximately equal to
- 2258 ≐ CORRESPONDS TO

2259	≐	ESTIMATES = corresponds to
225A	≐	EQUIANGULAR TO
225B	≐	STAR EQUALS
225C	≐	DELTA EQUAL TO = equiangular = equal to by definition
225D	≐	EQUAL TO BY DEFINITION
225E	≐	MEASURED BY
225F	≐	QUESTIONED EQUAL TO
2260	≠	NOT EQUAL TO → 003D = equals sign → 01C2 † latin letter alveolar click ≐ 003D = 0338 ∅
2261	≐	IDENTICAL TO
2262	≠	NOT IDENTICAL TO ≐ 2261 ≐ 0338 ∅
2263	≐	STRICTLY EQUIVALENT TO
2264	≤	LESS-THAN OR EQUAL TO → 003C < less-than sign
2265	≥	GREATER-THAN OR EQUAL TO → 003E > greater-than sign
2266	≤	LESS-THAN OVER EQUAL TO
2267	≥	GREATER-THAN OVER EQUAL TO
2268	≠	LESS-THAN BUT NOT EQUAL TO → 2A87 ≤ less-than and single-line not equal to ~ 2268 FE00 ≐ with vertical stroke
2269	≠	GREATER-THAN BUT NOT EQUAL TO → 2A88 ≥ greater-than and single-line not equal to ~ 2269 FE00 ≐ with vertical stroke
226A	≪	MUCH LESS-THAN → 00AB ≪ left-pointing double angle quotation mark
226B	≫	MUCH GREATER-THAN → 00BB ≫ right-pointing double angle quotation mark
226C	∅	BETWEEN = plaintiff, quantic
226D	≠	NOT EQUIVALENT TO ≐ 224D ≠ 0338 ∅
226E	≠	NOT LESS-THAN ≐ 003C < 0338 ∅
226F	≠	NOT GREATER-THAN ≐ 003E > 0338 ∅
2270	≠	NEITHER LESS-THAN NOR EQUAL TO ≐ 2264 ≤ 0338 ∅
2271	≠	NEITHER GREATER-THAN NOR EQUAL TO ≐ 2265 ≥ 0338 ∅
2272	≈	LESS-THAN OR EQUIVALENT TO ~ 2272 FE00 ≐ following the slant of the lower leg
2273	≈	GREATER-THAN OR EQUIVALENT TO ~ 2273 FE00 ≐ following the slant of the lower leg
2274	≠	NEITHER LESS-THAN NOR EQUIVALENT TO ≐ 2272 ≤ 0338 ∅
2275	≠	NEITHER GREATER-THAN NOR EQUIVALENT TO ≐ 2273 ≥ 0338 ∅
2276	≤	LESS-THAN OR GREATER-THAN
2277	≥	GREATER-THAN OR LESS-THAN
2278	≠	NEITHER LESS-THAN NOR GREATER-THAN ≐ 2276 ≤ 0338 ∅

2279	≠	NEITHER GREATER-THAN NOR LESS-THAN ≐ 2277 ≥ 0338 ∅
227A	<	PRECEDES = lower rank than → 22B0 ≐ precedes under relation
227B	>	SUCCEEDS = higher rank than → 22B1 ≐ succeeds under relation
227C	≤	PRECEDES OR EQUAL TO
227D	≥	SUCCEEDS OR EQUAL TO
227E	≈	PRECEDES OR EQUIVALENT TO
227F	≈	SUCCEEDS OR EQUIVALENT TO
2280	≠	DOES NOT PRECEDE ≐ 227A < 0338 ∅
2281	≠	DOES NOT SUCCEED ≐ 227B > 0338 ∅
2282	⊂	SUBSET OF = included in set → 2E26 ⊂ left sideways u bracket
2283	⊃	SUPERSET OF = includes in set → 2E27 ⊃ right sideways u bracket
2284	⊄	NOT A SUBSET OF ≐ 2282 ⊂ 0338 ∅
2285	⊇	NOT A SUPERSET OF ≐ 2283 ⊃ 0338 ∅
2286	⊆	SUBSET OF OR EQUAL TO
2287	⊇	SUPERSET OF OR EQUAL TO
2288	⊈	NEITHER A SUBSET OF NOR EQUAL TO ≐ 2286 ⊆ 0338 ∅
2289	⊉	NEITHER A SUPERSET OF NOR EQUAL TO ≐ 2287 ⊇ 0338 ∅
228A	⊈	SUBSET OF WITH NOT EQUAL TO ~ 228A FE00 ⊈ with stroke through bottom members
228B	⊉	SUPERSET OF WITH NOT EQUAL TO ~ 228B FE00 ⊉ with stroke through bottom members

Operators

228C	⊎	MULTISET
228D	⊗	MULTISET MULTIPLICATION → 2A03 ⊔ n-ary union operator with dot → 2A40 ∩ intersection with dot
228E	⊕	MULTISET UNION = z notation bag addition → 2A04 ⊕ n-ary union operator with plus

Relations

228F	⊠	SQUARE IMAGE OF
2290	⊡	SQUARE ORIGINAL OF
2291	⊢	SQUARE IMAGE OF OR EQUAL TO
2292	⊣	SQUARE ORIGINAL OF OR EQUAL TO

Operators

2293	⊞	SQUARE CAP → 2A05 ⊞ n-ary square intersection operator ~ 2293 FE00 ⊞ with serifs
2294	⊟	SQUARE CUP → 2A06 ⊟ n-ary square union operator ~ 2294 FE00 ⊟ with serifs

- 2295 \oplus CIRCLED PLUS
= direct sum
= vector pointing into page
→ 2A01 \oplus n-ary circled plus operator
→ 1F728 \oplus alchemical symbol for verdigris
~ 2295 FE00 \oplus with white rim
- 2296 \ominus CIRCLED MINUS
= symmetric difference
→ 29B5 \ominus circle with horizontal bar
→ 1F714 \ominus alchemical symbol for salt
- 2297 \otimes CIRCLED TIMES
= tensor product
= vector pointing into page
→ 26D2 \otimes circled crossing lanes
→ 2A02 \otimes n-ary circled times operator
→ 2BBE \otimes circled x
→ 1F774 \otimes lot of fortune
~ 2297 FE00 \otimes with white rim
- 2298 \oslash CIRCLED DIVISION SLASH
- 2299 \odot CIRCLED DOT OPERATOR
= direct product
= vector pointing out of page
→ 0298 \odot latin letter bilabial click
→ 2609 \odot sun
→ 2A00 \odot n-ary circled dot operator
- 229A \odot CIRCLED RING OPERATOR
→ 233E \odot apl functional symbol circle jot
→ 25CE \odot bullseye
- 229B \otimes CIRCLED ASTERISK OPERATOR
→ 235F \otimes apl functional symbol circle star
- 229C \ominus CIRCLED EQUALS
= NoDerivatives (symbol used for Creative Commons licenses)
→ 1F16D \ominus circled cc
~ 229C FE00 \ominus with equal sign touching the circle
- 229D \ominus CIRCLED DASH
- 229E \boxplus SQUARED PLUS
- 229F \boxminus SQUARED MINUS
- 22A0 \boxtimes SQUARED TIMES
→ 2612 \boxtimes ballot box with x
→ 26DD \boxtimes squared saltire
→ 1F771 \boxtimes alchemical symbol for month
- 22A1 \boxdot SQUARED DOT OPERATOR
→ 1F755 \boxdot alchemical symbol for urine
→ 1FBBC \boxdot right open squared dot
- 22A2 \vdash RIGHT TACK
= turnstile
= proves, implies, yields
= reducible
- 22A3 \dashv LEFT TACK
= reverse turnstile
= non-theorem, does not yield

Miscellaneous mathematical symbols

- 22A4 \top DOWN TACK
= top
→ 2E06 \top raised interpolation marker
→ 1F768 \top alchemical symbol for crucible-4
- 22A5 \perp UP TACK
= base, bottom
→ 27C2 \perp perpendicular

Relations

- 22A6 \vdash ASSERTION
= reduces to
- 22A7 \vDash MODELS
- 22A8 \vDash TRUE
= statement is true, valid
= is a tautology
= satisfies
= results in
- 22A9 \Vdash FORCES
- 22AA \equiv TRIPLE VERTICAL BAR RIGHT TURNSTILE
- 22AB \equiv DOUBLE VERTICAL BAR DOUBLE RIGHT TURNSTILE
- 22AC \nVdash DOES NOT PROVE
 \equiv 22A2 \vdash 0338 $\not\vdash$
- 22AD $\n\vDash$ NOT TRUE
 \equiv 22A8 \vDash 0338 $\not\vDash$
- 22AE \nVdash DOES NOT FORCE
 \equiv 22A9 \Vdash 0338 $\not\Vdash$
- 22AF $\n\equiv$ NEGATED DOUBLE VERTICAL BAR DOUBLE RIGHT TURNSTILE
 \equiv 22AB \equiv 0338 $\not\equiv$
- 22B0 \prec PRECEDES UNDER RELATION
→ 227A $<$ precedes
- 22B1 \succ SUCCEEDS UNDER RELATION
→ 227B $>$ succeeds
- 22B2 \triangleleft NORMAL SUBGROUP OF
→ 25C5 \triangleleft white left-pointing pointer
- 22B3 \triangleright CONTAINS AS NORMAL SUBGROUP
→ 25BB \triangleright white right-pointing pointer
- 22B4 \trianglelefteq NORMAL SUBGROUP OF OR EQUAL TO
- 22B5 \trianglerighteq CONTAINS AS NORMAL SUBGROUP OR EQUAL TO
- 22B6 \mapsto ORIGINAL OF
- 22B7 $\bullet\mapsto$ IMAGE OF
- 22B8 \multimap MULTIMAP
- 22B9 \dagger HERMITIAN CONJUGATE MATRIX

Operators

- 22BA \Uparrow INTERCALATE
- 22BB \curlywedge XOR
→ 26BA \curlywedge semisextile
- 22BC $\bar{\wedge}$ NAND
→ 2305 $\bar{\wedge}$ projective
→ 26BB $\bar{\wedge}$ quincunx
- 22BD ∇ NOR

Miscellaneous mathematical symbols

- 22BE \sphericalangle RIGHT ANGLE WITH ARC
- 22BF \triangle RIGHT TRIANGLE

N-ary operators

- 22C0 \bigwedge N-ARY LOGICAL AND
• also used to denote the universal quantifier
→ 2227 \wedge logical and
- 22C1 \bigvee N-ARY LOGICAL OR
• also used to denote the existential quantifier
→ 2228 \vee logical or
- 22C2 \bigcap N-ARY INTERSECTION
= z notation generalised intersection
→ 2229 \cap intersection
- 22C3 \bigcup N-ARY UNION
= z notation generalised union
→ 222A \cup union

Operators

- 22C4 ◊ DIAMOND OPERATOR
→ 25C7 ◇ white diamond
→ 2B29 ◆ black small diamond
- 22C5 · DOT OPERATOR
• preferred to 00B7 · for denotation of multiplication
→ 00B7 · middle dot
- 22C6 ★ STAR OPERATOR
• APL
→ 066D ★ arabic five pointed star
→ 2605 ★ black star
→ 2B50 ☆ white medium star
- 22C7 ✖ DIVISION TIMES
→ 00D7 × multiplication sign
→ 00F7 ÷ division sign
→ 2715 ✕ multiplication x

Relation

- 22C8 ⌘ BOWTIE
→ 2445 ⌘ ocr bow tie

Operators

- 22C9 ⋈ LEFT NORMAL FACTOR SEMIDIRECT PRODUCT
- 22CA ⋉ RIGHT NORMAL FACTOR SEMIDIRECT PRODUCT
- 22CB ⋊ LEFT SEMIDIRECT PRODUCT
- 22CC ⋋ RIGHT SEMIDIRECT PRODUCT
→ 2041 ⋋ caret insertion point

Relation

- 22CD ≍ REVERSED TILDE EQUALS

Logical operators

- 22CE ∨ CURLY LOGICAL OR
- 22CF ∧ CURLY LOGICAL AND

Relations

- 22D0 ⊆ DOUBLE SUBSET
- 22D1 ⊇ DOUBLE SUPERSET

Operators

- 22D2 ∩ DOUBLE INTERSECTION
- 22D3 ∪ DOUBLE UNION

Relations

- 22D4 ∩ PITCHFORK
= proper intersection
- 22D5 # EQUAL AND PARALLEL TO
→ 2317 # viewdata square
- 22D6 < LESS-THAN WITH DOT
- 22D7 > GREATER-THAN WITH DOT
- 22D8 ≪ VERY MUCH LESS-THAN
- 22D9 ≫ VERY MUCH GREATER-THAN
- 22DA ≍ LESS-THAN EQUAL TO OR GREATER-THAN
~ 22DA FE00 ≍ with slanted equal
- 22DB ≎ GREATER-THAN EQUAL TO OR LESS-THAN
~ 22DB FE00 ≎ with slanted equal
- 22DC ≐ EQUAL TO OR LESS-THAN
- 22DD ≑ EQUAL TO OR GREATER-THAN
- 22DE ≒ EQUAL TO OR PRECEDES
- 22DF ≓ EQUAL TO OR SUCCEEDS
- 22E0 ⋈ DOES NOT PRECEDE OR EQUAL
≍ 227C ≍ 0338 ⋈
- 22E1 ⋉ DOES NOT SUCCEED OR EQUAL
≍ 227D ≍ 0338 ⋉

- 22E2 ⋊ NOT SQUARE IMAGE OF OR EQUAL TO
≍ 2291 ⋊ 0338 ⋊
- 22E3 ⋋ NOT SQUARE ORIGINAL OF OR EQUAL TO
≍ 2292 ⋋ 0338 ⋋
- 22E4 ⋌ SQUARE IMAGE OF OR NOT EQUAL TO
- 22E5 ⋍ SQUARE ORIGINAL OF OR NOT EQUAL TO
- 22E6 ⋎ LESS-THAN BUT NOT EQUIVALENT TO
- 22E7 ⋏ GREATER-THAN BUT NOT EQUIVALENT TO
- 22E8 ⋐ PRECEDES BUT NOT EQUIVALENT TO
- 22E9 ⋑ SUCCEEDS BUT NOT EQUIVALENT TO
- 22EA ⋒ NOT NORMAL SUBGROUP OF
≍ 22B2 ⋒ 0338 ⋒
- 22EB ⋓ DOES NOT CONTAIN AS NORMAL SUBGROUP
≍ 22B3 ⋓ 0338 ⋓
- 22EC ⋔ NOT NORMAL SUBGROUP OF OR EQUAL TO
≍ 22B4 ⋔ 0338 ⋔
- 22ED ⋕ DOES NOT CONTAIN AS NORMAL SUBGROUP OR EQUAL
≍ 22B5 ⋕ 0338 ⋕

































Matrix ellipses

These four ellipsis characters are used for matrix row/column elision.

- 22EE ∴ VERTICAL ELLIPSIS
→ 205D ∴ tricolon
→ 2026 ∴ horizontal ellipsis
→ FE19 ∴ presentation form for vertical horizontal ellipsis
- 22EF ∴ MIDLINE HORIZONTAL ELLIPSIS
- 22F0 ∴ UP RIGHT DIAGONAL ELLIPSIS
- 22F1 ∴ DOWN RIGHT DIAGONAL ELLIPSIS

Relations

- 22F2 ∈ ELEMENT OF WITH LONG HORIZONTAL STROKE
- 22F3 ∋ ELEMENT OF WITH VERTICAL BAR AT END OF HORIZONTAL STROKE
- 22F4 ∉ SMALL ELEMENT OF WITH VERTICAL BAR AT END OF HORIZONTAL STROKE
- 22F5 ∊ ELEMENT OF WITH DOT ABOVE
- 22F6 ∅ ELEMENT OF WITH OVERBAR
- 22F7 ∅ SMALL ELEMENT OF WITH OVERBAR
- 22F8 ∅ ELEMENT OF WITH UNDERBAR
- 22F9 ∅ ELEMENT OF WITH TWO HORIZONTAL STROKES
- 22FA ⊃ CONTAINS WITH LONG HORIZONTAL STROKE
- 22FB ⊃ CONTAINS WITH VERTICAL BAR AT END OF HORIZONTAL STROKE
- 22FC ⊂ SMALL CONTAINS WITH VERTICAL BAR AT END OF HORIZONTAL STROKE
- 22FD ⊃ CONTAINS WITH OVERBAR
- 22FE ⊂ SMALL CONTAINS WITH OVERBAR
- 22FF ∈ Z NOTATION BAG MEMBERSHIP

Standardized Variation Sequences	
2205	 EMPTY SET <small>2205</small>  zero with long diagonal stroke overlay form <small>2205 FE00</small>
2229	 INTERSECTION <small>2229</small>  with serifs <small>2229 FE00</small>
222A	 UNION <small>222A</small>  with serifs <small>222A FE00</small>
2268	 LESS-THAN BUT NOT EQUAL TO <small>2268</small>  with vertical stroke <small>2268 FE00</small>
2269	 GREATER-THAN BUT NOT EQUAL TO <small>2269</small>  with vertical stroke <small>2269 FE00</small>
2272	 LESS-THAN OR EQUIVALENT TO <small>2272</small>  following the slant of the lower leg <small>2272 FE00</small>
2273	 GREATER-THAN OR EQUIVALENT TO <small>2273</small>  following the slant of the lower leg <small>2273 FE00</small>
228A	 SUBSET OF WITH NOT EQUAL TO <small>228A</small>  with stroke through bottom members <small>228A FE00</small>
228B	 SUPERSET OF WITH NOT EQUAL TO <small>228B</small>  with stroke through bottom members <small>228B FE00</small>
2293	 SQUARE CAP <small>2293</small>  with serifs <small>2293 FE00</small>
2294	 SQUARE CUP <small>2294</small>  with serifs <small>2294 FE00</small>
2295	 CIRCLED PLUS <small>2295</small>  with white rim <small>2295 FE00</small>
2297	 CIRCLED TIMES <small>2297</small>  with white rim <small>2297 FE00</small>
229C	 CIRCLED EQUALS <small>229C</small>  with equal sign touching the circle <small>229C FE00</small>
22DA	 LESS-THAN EQUAL TO OR GREATER-THAN <small>22DA</small>  with slanted equal <small>22DA FE00</small>
22DB	 GREATER-THAN EQUAL TO OR LESS-THAN <small>22DB</small>  with slanted equal <small>22DB FE00</small>