

Mathematical Operators

Range: 2200–22FF

This file contains an excerpt from the character code tables and list of character names for *The Unicode Standard, Version 10.0*

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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-10.0/> for charts showing only the characters added in Unicode 10.0.
See <http://www.unicode.org/Public/10.0.0/charts/> for a complete archived file of character code charts for Unicode 10.0.

Disclaimer

These charts are provided as the online reference to the character contents of the Unicode Standard, Version 10.0 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 10.0, online at <http://www.unicode.org/versions/Unicode10.0.0/>, as well as Unicode Standard Annexes #9, #11, #14, #15, #24, #29, #31, #34, #38, #41, #42, #44, and #45, 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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	220	221	222	223	224	225	226	227	228	229	22A	22B	22C	22D	22E	22F
0	∇ 2200	\amalg 2210	\angle 2220	\int 2230	\sim 2240	\doteq 2250	\neq 2260	\nlessgtr 2270	\nlessgtr 2280	\sqsupset 2290	\boxtimes 22A0	\wp 22B0	\bigwedge 22C0	\in 22D0	\nlessgtr 22E0	\ddots 22F0
1	\complement 2201	\sum 2211	\triangleleft 2221	f 2231	\approx 2241	\doteq 2251	\equiv 2261	\nlessgtr 2271	\nlessgtr 2281	\sqsubseteq 2291	\square 22A1	\wp 22B1	\bigvee 22C1	\supset 22D1	\nlessgtr 22E1	\ddots 22F1
2	∂ 2202	$-$ 2212	\triangleleft 2222	ϕ 2232	\approx 2242	\doteq 2252	\neq 2262	\nlessgtr 2272	\subset 2282	\sqsubseteq 2292	\top 22A2	\triangle 22B2	\cup 22C2	\supseteq 22D2	\nlessgtr 22E2	\in 22F2
3	\exists 2203	\mp 2213	$ $ 2223	ϕ 2233	\approx 2243	\doteq 2253	\equiv 2263	\nlessgtr 2273	\supset 2283	\sqsupset 2293	\top 22A3	\triangle 22B3	\cup 22C3	\supseteq 22D3	\nlessgtr 22E3	\in 22F3
4	\nlessgtr 2204	\dagger 2214	\dagger 2224	\ddots 2234	\nlessgtr 2244	\doteq 2254	\leq 2264	\nlessgtr 2274	\nlessgtr 2284	\sqsupset 2294	\top 22A4	\triangle 22B4	\diamond 22C4	\supset 22D4	\sqsupset 22E4	\in 22F4
5	\emptyset 2205	$/$ 2215	\parallel 2225	\ddots 2235	\approx 2245	\doteq 2255	\geq 2265	\nlessgtr 2275	\nlessgtr 2285	\oplus 2295	\perp 22A5	\triangle 22B5	\cdot 22C5	$\#$ 22D5	\sqsupset 22E5	\in 22F5
6	\triangle 2206	\setminus 2216	$\#$ 2226	\cdot 2236	\nlessgtr 2246	\nlessgtr 2256	\geq 2266	\geq 2276	\subset 2286	\ominus 2296	\top 22A6	\circ 22B6	\star 22C6	\nlessgtr 22D6	\nlessgtr 22E6	\in 22F6
7	∇ 2207	$*$ 2217	\wedge 2227	\ddots 2237	\nlessgtr 2247	\doteq 2257	\geq 2267	\geq 2277	\supset 2287	\otimes 2297	\top 22A7	\circ 22B7	$*$ 22C7	\nlessgtr 22D7	\nlessgtr 22E7	\in 22F7
8	\in 2208	\circ 2218	\vee 2228	\cdot 2238	\approx 2248	\doteq 2258	\nlessgtr 2268	\nlessgtr 2278	\nlessgtr 2288	\ominus 2298	\top 22A8	\circ 22B8	\otimes 22C8	\nlessgtr 22D8	\nlessgtr 22E8	\in 22F8
9	\nlessgtr 2209	\cdot 2219	\cup 2229	\cdot 2239	\nlessgtr 2249	\doteq 2259	\nlessgtr 2269	\nlessgtr 2279	\nlessgtr 2289	\odot 2299	\top 22A9	\dagger 22B9	\otimes 22C9	\nlessgtr 22D9	\nlessgtr 22E9	\in 22F9
A	\in 220A	$\sqrt{\quad}$ 221A	\cup 222A	\ddots 223A	\approx 224A	\doteq 225A	\nlessgtr 226A	\nlessgtr 227A	\nlessgtr 228A	\odot 229A	\top 22AA	\top 22BA	\otimes 22CA	\nlessgtr 22DA	\nlessgtr 22EA	\in 22FA
B	\supset 220B	$\sqrt[3]{\quad}$ 221B	\int 222B	\approx 223B	\approx 224B	\doteq 225B	\nlessgtr 226B	\nlessgtr 227B	\nlessgtr 228B	\otimes 229B	\top 22AB	\nlessgtr 22BB	\nlessgtr 22CB	\nlessgtr 22DB	\nlessgtr 22EB	\in 22FB
C	\nlessgtr 220C	$\sqrt[4]{\quad}$ 221C	\iint 222C	\sim 223C	\approx 224C	\doteq 225C	\nlessgtr 226C	\nlessgtr 227C	\nlessgtr 228C	\ominus 229C	\nlessgtr 22AC	\nlessgtr 22BC	\nlessgtr 22CC	\nlessgtr 22DC	\nlessgtr 22EC	\in 22FC
D	\supset 220D	α 221D	\iiint 222D	\sim 223D	\nlessgtr 224D	\doteq 225D	\nlessgtr 226D	\nlessgtr 227D	\nlessgtr 228D	\ominus 229D	\nlessgtr 22AD	\nlessgtr 22BD	\nlessgtr 22CD	\nlessgtr 22DD	\nlessgtr 22ED	\in 22FD
E	\blacksquare 220E	∞ 221E	ϕ 222E	\sim 223E	\nlessgtr 224E	\doteq 225E	\nlessgtr 226E	\nlessgtr 227E	\nlessgtr 228E	\boxplus 229E	\nlessgtr 22AE	\nlessgtr 22BE	\nlessgtr 22CE	\nlessgtr 22DE	\ddots 22EE	\in 22FE
F	\amalg 220F	\perp 221F	\int 222F	\sim 223F	\nlessgtr 224F	\doteq 225F	\nlessgtr 226F	\nlessgtr 227F	\sqsupset 228F	\square 229F	\nlessgtr 22AF	\triangle 22BF	\nlessgtr 22CF	\nlessgtr 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 \notin
- 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 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 \circ white bullet
→ 10B39 $^\circ$ avestan abbreviation mark
- 2219 \bullet BULLET OPERATOR
→ 00B7 \cdot middle dot
→ 2022 \bullet bullet
→ 2024 \cdot one dot leader
- 221A \surd SQUARE ROOT
= radical sign
→ 2713 \surd check mark
- 221B $\sqrt[3]{}$ CUBE ROOT
→ 0606 $\sqrt[3]{}$ arabic-indic cube root
- 221C $\sqrt[4]{}$ FOURTH ROOT
→ 0607 $\sqrt[4]{}$ 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
- 2220 \sphericalangle ANGLE
→ 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 PARALLEL TO
→ 01C1 \parallel latin letter lateral click
→ 2016 \parallel double vertical line
- 2226 \nparallel NOT PARALLEL TO
≡ 2225 \parallel 0338 $\not\parallel$

Logical and set operators

- 2227 \wedge LOGICAL AND
= wedge, conjunction
→ 22C0 \bigwedge n-ary logical and
→ 2303 \frown up arrowhead
- 2228 \vee LOGICAL OR
= vee, disjunction
→ 22C1 \bigvee n-ary logical or
→ 2304 \vee down arrowhead
- 2229 \cap INTERSECTION
= cap, hat
→ 22C2 \bigcap n-ary intersection
~ 2229 FE00 \cap with serifs
- 222A \cup UNION
= cup
→ 22C3 \bigcup n-ary union
~ 222A FE00 \cup with serifs

Integrals

- 222B \int INTEGRAL
→ 0283 \int latin small letter esh
- 222C \iint DOUBLE INTEGRAL
≈ 222B \int 222B \int
- 222D \iiint TRIPLE INTEGRAL
→ 2A0C \iiint quadruple integral operator
≈ 222B \int 222B \int 222B \int
- 222E \oint CONTOUR INTEGRAL
→ 2A15 \oint integral around a point operator
- 222F \oiint SURFACE INTEGRAL
≈ 222E \oint 222E \oint
- 2230 \iiint VOLUME INTEGRAL
≈ 222E \oint 222E \oint 222E \oint
- 2231 $\int\limits_{\circlearrowright}$ CLOCKWISE INTEGRAL
- 2232 $\int\limits_{\circlearrowleft}$ CLOCKWISE CONTOUR INTEGRAL
- 2233 $\int\limits_{\circlearrowright}$ ANTICLOCKWISE CONTOUR INTEGRAL
• clockwise or anticlockwise arrows do not reverse during layout mirroring

Miscellaneous mathematical symbols

- 2234 \therefore THEREFORE
→ 26EC \therefore historic site
- 2235 \because BECAUSE

Relations

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

Operator

- 2238 $\dot{-}$ 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
- 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	2280	⋈	DOES NOT PRECEDE ≝ 227A < 0338 ∅
225E	≍	MEASURED BY	2281	⋉	DOES NOT SUCCEED ≝ 227B > 0338 ∅
225F	≎	QUESTIONED EQUAL TO	2282	⊂	SUBSET OF = included in set → 2E26 ⊂ left sideways u bracket
2260	≠	NOT EQUAL TO → 003D = equals sign → 01C2 † latin letter alveolar click ≝ 003D = 0338 ∅	2283	⊃	SUPERSET OF = includes in set → 2E27 ⊃ right sideways u bracket
2261	≡	IDENTICAL TO	2284	⊄	NOT A SUBSET OF ≝ 2282 ⊂ 0338 ∅
2262	≢	NOT IDENTICAL TO ≝ 2261 ≡ 0338 ∅	2285	⊇	NOT A SUPERSET OF ≝ 2283 ⊃ 0338 ∅
2263	≣	STRICTLY EQUIVALENT TO	2286	⊆	SUBSET OF OR EQUAL TO
2264	≤	LESS-THAN OR EQUAL TO	2287	⊇	SUPERSET OF OR EQUAL TO
2265	≥	GREATER-THAN OR EQUAL TO	2288	⊈	NEITHER A SUBSET OF NOR EQUAL TO ≝ 2286 ⊆ 0338 ∅
2266	≤	LESS-THAN OVER EQUAL TO	2289	⊉	NEITHER A SUPERSET OF NOR EQUAL TO ≝ 2287 ⊇ 0338 ∅
2267	≥	GREATER-THAN OVER EQUAL TO	228A	⊆̅	SUBSET OF WITH NOT EQUAL TO ~ 228A FE00 ⊆̅ with stroke through bottom members
2268	≢	LESS-THAN BUT NOT EQUAL TO ~ 2268 FE00 ≢ with vertical stroke	228B	⊇̅	SUPERSET OF WITH NOT EQUAL TO ~ 228B FE00 ⊇̅ with stroke through bottom members
2269	≣	GREATER-THAN BUT NOT EQUAL TO ~ 2269 FE00 ≣ with vertical stroke			Operators
226A	≪	MUCH LESS-THAN → 00AB ≪ left-pointing double angle quotation mark	228C	⊍	MULTISET
226B	≫	MUCH GREATER-THAN → 00BB ≫ right-pointing double angle quotation mark	228D	⊎	MULTISET MULTIPLICATION → 2A03 ⊎ n-ary union operator with dot → 2A40 ⊎ intersection with dot
226C	⊘	BETWEEN = plaintiff, quantic	228E	⊕	MULTISET UNION = z notation bag addition → 2A04 ⊕ n-ary union operator with plus
226D	⋈	NOT EQUIVALENT TO ≝ 224D × 0338 ∅			Relations
226E	⋉	NOT LESS-THAN ≝ 003C < 0338 ∅	228F	⊂	SQUARE IMAGE OF
226F	⋊	NOT GREATER-THAN ≝ 003E > 0338 ∅	2290	⊃	SQUARE ORIGINAL OF
2270	⋈	NEITHER LESS-THAN NOR EQUAL TO ≝ 2264 ≤ 0338 ∅	2291	⊆	SQUARE IMAGE OF OR EQUAL TO
2271	⋉	NEITHER GREATER-THAN NOR EQUAL TO ≝ 2265 ≥ 0338 ∅	2292	⊇	SQUARE ORIGINAL OF OR EQUAL TO
2272	≤	LESS-THAN OR EQUIVALENT TO ~ 2272 FE00 ≤ following the slant of the lower leg			Operators
2273	≥	GREATER-THAN OR EQUIVALENT TO ~ 2273 FE00 ≥ following the slant of the lower leg	2293	⊐	SQUARE CAP → 2A05 ⊐ n-ary square intersection operator ~ 2293 FE00 ⊐ with serifs
2274	⋈	NEITHER LESS-THAN NOR EQUIVALENT TO ≝ 2272 ≤ 0338 ∅	2294	⊑	SQUARE CUP → 2A06 ⊑ n-ary square union operator ~ 2294 FE00 ⊑ with serifs
2275	⋉	NEITHER GREATER-THAN NOR EQUIVALENT TO ≝ 2273 ≥ 0338 ∅	2295	⊕	CIRCLED PLUS = direct sum = vector pointing into page → 2A01 ⊕ n-ary circled plus operator → 1F728 ⊕ alchemical symbol for verdigris ~ 2295 FE00 ⊕ with white rim
2276	≤	LESS-THAN OR GREATER-THAN	2296	⊖	CIRCLED MINUS = symmetric difference → 29B5 ⊖ circle with horizontal bar → 1F714 ⊖ alchemical symbol for salt
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			

- 2297 ⊗ CIRCLED TIMES
= tensor product
= vector pointing into page
→ 26D2 ⊗ circled crossing lanes
→ 2A02 ⊗ n-ary circled times operator
→ 2BBE ⊗ circled x
~ 2297 FE00 ⊗ with white rim
- 2298 ⊘ CIRCLED DIVISION SLASH
- 2299 ⊙ CIRCLED DOT OPERATOR
= direct product
= vector pointing out of page
→ 0298 ⊙ latin letter bilabial click
→ 2609 ⊙ sun
→ 2A00 ⊙ n-ary circled dot operator
- 229A ⊚ CIRCLED RING OPERATOR
→ 233E ⊚ apl functional symbol circle jot
→ 25CE ⊚ bullseye
- 229B ⊛ CIRCLED ASTERISK OPERATOR
→ 235F ⊛ apl functional symbol circle star
- 229C ⊕ CIRCLED EQUALS
~ 229C FE00 ⊕ with equal sign touching the circle
- 229D ⊖ CIRCLED DASH
- 229E ⊞ SQUARED PLUS
- 229F ⊟ SQUARED MINUS
- 22A0 ⊠ SQUARED TIMES
→ 2612 ⊠ ballot box with x
→ 26DD ⊠ squared saltire
→ 1F771 ⊠ alchemical symbol for month
- 22A1 ⊡ SQUARED DOT OPERATOR
→ 1F755 ⊡ alchemical symbol for urine
- 22A2 ⊢ RIGHT TACK
= turnstile
= proves, implies, yields
= reducible
- 22A3 ⊣ LEFT TACK
= reverse turnstile
= non-theorem, does not yield

Miscellaneous mathematical symbols

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

Relations

- 22A6 ⊢ ASSERTION
= reduces to
- 22A7 ⊨ MODELS
- 22A8 ⊨ TRUE
= statement is true, valid
= is a tautology
= satisfies
= results in
- 22A9 ⊨ FORCES
- 22AA ≡ TRIPLE VERTICAL BAR RIGHT TURNSTILE
- 22AB ≡ DOUBLE VERTICAL BAR DOUBLE RIGHT TURNSTILE
- 22AC ⊯ DOES NOT PROVE
≡ 22A2 ⊢ 0338 ∅
- 22AD ⊭ NOT TRUE
≡ 22A8 ≡ 0338 ∅

- 22AE ⊯ DOES NOT FORCE
≡ 22A9 ≡ 0338 ∅
- 22AF ⊯ NEGATED DOUBLE VERTICAL BAR DOUBLE RIGHT TURNSTILE
≡ 22AB ≡ 0338 ∅
- 22B0 ≺ PRECEDES UNDER RELATION
→ 227A < precedes
- 22B1 ≻ SUCCEEDS UNDER RELATION
→ 227B > succeeds
- 22B2 ◁ NORMAL SUBGROUP OF
→ 25C5 ◁ white left-pointing pointer
- 22B3 ▷ CONTAINS AS NORMAL SUBGROUP
→ 25BB ▷ white right-pointing pointer
- 22B4 ⊑ NORMAL SUBGROUP OF OR EQUAL TO
- 22B5 ⊒ CONTAINS AS NORMAL SUBGROUP OR EQUAL TO
- 22B6 ↪ ORIGINAL OF
- 22B7 ↩ IMAGE OF
- 22B8 ↷ MULTIMAP
- 22B9 † HERMITIAN CONJUGATE MATRIX

Operators

- 22BA † INTERCALATE
- 22BB ⊕ XOR
→ 26BA ⊕ semisextile
- 22BC ⊗ NAND
→ 2305 ⊗ projective
→ 26BB ⊗ quincunx
- 22BD ∇ NOR

Miscellaneous mathematical symbols

- 22BE ⊔ RIGHT ANGLE WITH ARC
- 22BF ⊔ RIGHT TRIANGLE

N-ary operators

- 22C0 ∧ N-ARY LOGICAL AND
• also used to denote the universal quantifier
→ 2227 ∧ logical and
- 22C1 ∨ N-ARY LOGICAL OR
• also used to denote the existential quantifier
→ 2228 ∨ logical or
- 22C2 ∩ N-ARY INTERSECTION
= z notation generalised intersection
→ 2229 ∩ intersection
- 22C3 ∪ N-ARY UNION
= z notation generalised union
→ 222A ∪ 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

Relation

22C8 \bowtie BOWTIE
 → 2445 ^{ms} ocr bow tie

Operators

22C9 \ltimes LEFT NORMAL FACTOR SEMIDIRECT PRODUCT
 22CA \rtimes RIGHT NORMAL FACTOR SEMIDIRECT PRODUCT
 22CB \lrcorner LEFT SEMIDIRECT PRODUCT
 22CC \rceil RIGHT SEMIDIRECT PRODUCT
 → 2041 λ caret insertion point

Relation

22CD \preceq REVERSED TILDE EQUALS

Logical operators

22CE \vee CURLY LOGICAL OR
 22CF \wedge CURLY LOGICAL AND

Relations

22D0 \Subset DOUBLE SUBSET
 22D1 \Supset DOUBLE SUPerset

Operators

22D2 \cap DOUBLE INTERSECTION
 22D3 \cup DOUBLE UNION

Relations

22D4 \pitchfork PITCHFORK
 = proper intersection
 22D5 $\#$ EQUAL AND PARALLEL TO
 → 2317 \boxplus viewdata square
 22D6 \lessdot LESS-THAN WITH DOT
 22D7 \gtrdot GREATER-THAN WITH DOT
 22D8 \lll VERY MUCH LESS-THAN
 22D9 \ggg VERY MUCH GREATER-THAN
 22DA \lesseqgtr LESS-THAN EQUAL TO OR GREATER-THAN
 ~ 22DA FE00 \lesseqgtr with slanted equal
 22DB \gtrreqless GREATER-THAN EQUAL TO OR LESS-THAN
 ~ 22DB FE00 \gtrreqless with slanted equal
 22DC \lesseqgtr EQUAL TO OR LESS-THAN
 22DD \gtrreqless EQUAL TO OR GREATER-THAN
 22DE \lesseqgtr EQUAL TO OR PRECEDES
 22DF \gtrreqless EQUAL TO OR SUCCEEDS
 22E0 \nsubseteq DOES NOT PRECEDE OR EQUAL
 ≡ 227C \leqslant 0338 $\not\leqslant$
 22E1 \nsucceq DOES NOT SUCCEED OR EQUAL
 ≡ 227D \geqslant 0338 $\not\geqslant$
 22E2 \nsubseteq NOT SQUARE IMAGE OF OR EQUAL TO
 ≡ 2291 \sqsubseteq 0338 $\not\sqsubseteq$
 22E3 \nsubseteq NOT SQUARE ORIGINAL OF OR EQUAL TO
 ≡ 2292 \sqsupseteq 0338 $\not\sqsupseteq$
 22E4 \sqsubset SQUARE IMAGE OF OR NOT EQUAL TO
 22E5 \sqsupset SQUARE ORIGINAL OF OR NOT EQUAL TO
 22E6 \nlessdot LESS-THAN BUT NOT EQUIVALENT TO
 22E7 \ngtrdot GREATER-THAN BUT NOT EQUIVALENT TO
 22E8 \npreceq PRECEDES BUT NOT EQUIVALENT TO
 22E9 \nsucceq SUCCEEDS BUT NOT EQUIVALENT TO
 22EA \nsubseteq NOT NORMAL SUBGROUP OF
 ≡ 22B2 \triangleleft 0338 $\not\triangleleft$
 22EB \nsubseteq DOES NOT CONTAIN AS NORMAL SUBGROUP
 ≡ 22B3 \triangleright 0338 $\not\triangleright$
 22EC \nsubseteq NOT NORMAL SUBGROUP OF OR EQUAL TO
 ≡ 22B4 \triangleleft 0338 $\not\triangleleft$

22ED \nsubseteq DOES NOT CONTAIN AS NORMAL SUBGROUP OR EQUAL
 ≡ 22B5 \triangleright 0338 $\not\triangleright$

22EE \vdots VERTICAL ELLIPSIS

- these four ellipses are used for matrix row/column elision
- 205D \vdots tricolon
- 2026 \dots horizontal ellipsis
- FE19 \vdots presentation form for vertical horizontal ellipsis

22EF \cdots MIDLINE HORIZONTAL ELLIPSIS

22F0 \ddots UP RIGHT DIAGONAL ELLIPSIS

22F1 $\ddot{\cdot}$ DOWN RIGHT DIAGONAL ELLIPSIS

22F2 \in ELEMENT OF WITH LONG HORIZONTAL STROKE

22F3 \in ELEMENT OF WITH VERTICAL BAR AT END OF HORIZONTAL STROKE

22F4 ϵ SMALL ELEMENT OF WITH VERTICAL BAR AT END OF HORIZONTAL STROKE

22F5 $\acute{\in}$ ELEMENT OF WITH DOT ABOVE

22F6 $\bar{\in}$ ELEMENT OF WITH OVERBAR

22F7 $\bar{\epsilon}$ SMALL ELEMENT OF WITH OVERBAR

22F8 $\underline{\in}$ ELEMENT OF WITH UNDERBAR

22F9 \in ELEMENT OF WITH TWO HORIZONTAL STROKES

22FA \supset CONTAINS WITH LONG HORIZONTAL STROKE

































22FB \supset CONTAINS WITH VERTICAL BAR AT END OF HORIZONTAL STROKE

22FC \supset SMALL CONTAINS WITH VERTICAL BAR AT END OF HORIZONTAL STROKE

22FD \supset CONTAINS WITH OVERBAR

22FE \supset SMALL CONTAINS WITH OVERBAR

22FF \in 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>