INTERNATIONAL STANDARD

ISO 6862

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Information and documentation — Mathematical coded character set for bibliographic information interchange

Information et documentation — Jeu de caractères codés mathématiques pour les échanges d'informations bibliographiques

Reference number
ISO 6862:1996(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 6862 was prepared by Technical Committee ISO/TC 46, *Information and documentation*, Subcommittee SC 4, *Computer applications in information and documentation*.

Annex A of this International Standard is for information only.

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Information and documentation — Mathematical coded character set for bibliographic information interchange

1 Scope

1.1 This International Standard specifies a set of 188 graphic characters with their coded representations. It consists of code tables and a legend showing each graphic together with its name or meaning. Explanatory notes are also included.

1.2 These characters, together with characters in the international reference version of ISO 646 (ISO escape sequence ESC 2/8 4/0), in the extension of the Latin alphabet coded character set for bibliographic information interchange [ISO 5426[1)]] and in the Greek alphabet coded character set for bibliographic information interchange [ISO 5428[2)]] constitute a character set for the international exchange of bibliographic records including their annotations, incorporating symbols mainly from the following disciplines:

Algebra
Arithmetic
Calculus
Cybernetics
Geometry
Hyperbolic functions
Logic
Mechanics
Probability studies
Set theory
Statistics
Topology
Trigonometry
Vectors

1.3 This International Standard is concerned with the transmission of mathematical characters in bibliographic records, not with their use in source documents: the descriptions and comments in the legend are therefore neither prescriptive nor exhaustive. This means that there is no restriction against the use of a particular symbol in interchange of information in the form in which it appears in the data to be transmitted, even if its name or meaning as given in this International Standard does not cover its use in that particular context.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO/IEC 2022:1994, *Information technology — Character code structure and extension techniques.*

ISO 2375:1985, *Data processing — Procedure for registration of escape sequences.*

1) Escape sequences:
G0: ESC 2/8 5/0
G1: ESC 2/9 5/0
G2: ESC 2/10 5/0
G3: ESC 2/11 5/0

2) Escape sequences:
G0: ESC 2/8 5/3
G1: ESC 2/9 5/3
G2: ESC 2/10 5/3
G3: ESC 2/11 5/3

3 Implementation

3.1 The implementation of this coded character set in physical media and for transmission, taking into account the need for error checking, is the subject of other International Standards (see annex A).

3.2 The implementation of this International Standard is in accordance with the provisions of ISO 2022 and is identified by the escape sequences ESC (in accordance with ISO 2375).[3)]

3.3 The unassigned positions in the code tables are not to be utilized in the international exchange of bibliographic information.

3) The Registration Authority.

4 Code tables of mathematical coded characters

The mathematical character set is given in tables 1 and 2.

Table 1 — Basic set G0

b_4	b_3	b_2	b_1		b_7 0	0	0	0	1	1	1	1
					b_6 0	0	1	1	0	0	1	1
					b_5 0	1	0	1	0	1	0	1
					0	1	2	3	4	5	6	7
0	0	0	0	0				×	÷	+	−	′
0	0	0	1	1			/	±	∓	⊂	⊃	″
0	0	1	0	2			|	~	≃	⊆	⊇	‴
0	0	1	1	3			'	≈	≅	⊄	∋	∨
0	1	0	0	4			←	≡	≠	⋃	⋂	∧
0	1	0	1	5			◯	≤	≥	∀	∃	¬
0	1	1	0	6			Q	≪	≫	⊂	∅	*h*
0	1	1	1	7			◯	≤	≥	↑	↓	⊢
1	0	0	0	8			↶	≪	≫	←	→	∫
1	0	0	1	9			·	∥	⊥	↶	↷	∬
1	0	1	0	10			¨	∟	∠	↔	↕	∭
1	0	1	1	11			←	Δ	∇	⇆	⇄	∂
1	1	0	0	12			ˆ	°	‰	↦	⇅	*ħ*
1	1	0	1	13			ˇ	〈	〉	⇑	⇓	ℵ
1	1	1	0	14			→	⟦	⟧	⇐	⇒	○
1	1	1	1	15			↷	Σ	Π	∞	√	

Table 2 — Extension of basic set G1

				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7
0	0	0	0	0				≠	≃	‖	|	≒
0	0	0	1	1			⊕	≓	∷	╱	╲	∺
0	0	1	0	2			⊖	⁅	⁆	⊤	\	∝
0	0	1	1	3			⊗	∟	⌋	∨	∧	≀
0	1	0	0	4			⊙	⋮	≎	∪	∩	⊧
0	1	0	1	5			∴	⌈	⌉	⊂	⊃	⊢
0	1	1	0	6			∵	⊑	⊒	∈	∋	∦
0	1	1	1	7			⊏	⊔	⊓	↖	↗	∤
1	0	0	0	8			⊐	◿	◿̲	↙	↘	↚
1	0	0	1	9			●—○	≿	≾	↾	⇝	⇜
1	0	1	0	10			○—●	≺	≻	↛	↠	⇔
1	0	1	1	11			⊹	⋞	⋟	↪	↩	⇕
1	1	0	0	12			∔	∸	≐	○	●	ʼ
1	1	0	1	13			⁓	≙	≚	□	■	℘
1	1	1	0	14			∻	◁	▷	▭	▱	℞
1	1	1	1	15			ɜ	△	▽	◇	⋇	

5 Legend

A legend for tables 1 and 2 is given in table 3.

Table 3 — Legend

Position in table 1	Graphics	Name or meaning	Comments	Coding
2/1	/	Negation: oblique	Overlay character	nego or /
2/2	|	Negation: long bar	Overlay character	negl or /
2/3	'	Negation: short bar	Overlay character	negs or /
2/4	–	Negation: horizontal	Overlay character	negh or —
2/5	◯	Circle, overlay	Overlay character for integral, etc.	ciro
2/6	↺	Circle, anti-clockwise arrow	Overlay character for integral	ciroa
2/7	↻	Circle, clockwise arrow	Overlay character for integral	ciroc
2/8	↶	Anti-clockwise arrow	Overlay character	arroa
2/9	·	Superior dot	Overlay character	dots
2/10	¨	Superior double dot	Overlay character	ddots
2/11	←	Superior vector left	Overlay character	arls
2/12	^	Superior hat	Overlay character	checkas
2/13	ˇ	Superior V	Overlay character	ckackas
2/14	→	Superior vector right	Overlay character	arrs
2/15	↷	Clockwise arrow	Overlay character	arroc
3/0	×	Multiply		times or ×
3/1	±	Plus or minus		plmin
3/2	~	Equivalent to	Also: negation, or proportional to	sim
3/3	≈	Asymptotic to	Also: approximately equal to	dsim
3/4	≡	Identical with		iden
3/5	≤	Less than or equal to		lto
3/6	≶	Less than or greater than		lessgrtr

Table 3 *(continued)*

Position in table 1	Graphics	Name or meaning	Comments	Coding
3/7	$\lesssim$	Less than or equivalent to		lesssim
3/8	$\ll$	Much less than		less2
3/9	$\parallel$	Parallel to	See also table 2 5/0: norm of a matrix	parr
3/10	$\llcorner$	Right angle	Also: factorial	rang
3/11	Δ	Increment		incre
3/12	$^\circ$	Degree		deg
3/13	$\langle$	Left angle bracket		labrak or <
3/14	$\llbracket$	Left open bracket		lobrak or [
3/15	Σ	Sum of		sum
4/0	$\div$	Divide	Alternative to ISO 646	div or /
4/1	$\mp$	Minus or plus		minpl
4/2	$\simeq$	Asymptotically equal to		simeq
4/3	$\cong$	Similar to		congr
4/4	$\backsimeq$	Approximately equal to		libra
4/5	$\geqslant$	Greater than or equal to		gto
4/6	$\gtrless$	Greater than or less than		grtrless
4/7	$\gtrsim$	Greater than or equivalent to		grtrsim
4/8	$\gg$	Much greater than		grtr2
4/9	$\perp$	Orthogonal to	Also: bottom element	perp
4/10	$\angle$	Angle		ang
4/11	∇	Backward finite difference operator	Also: nabla operators	nabla
4/12	$‰$	Per mille		perk
4/13	$\rangle$	Angle bracket, right		rabrak or >
4/14	$\rrbracket$	Open bracket, right		robrak or]
4/15	Π	Product		prod

Table 3 *(continued)*

Position in table 1	Graphics	Name or meaning	Comments	Coding
5/0	+	Plus		plus or +
5/1	⊂	Proper inclusion in set		lhook
5/2	⊆	Identity or inclusion in set	Also: identity	lkkeq
5/3	∈	Set membership		mem
5/4	⋃	Union of sets between limits		cup
5/5	∀	For all		inva
5/6	∁	Complement		longc
5/7	↑	Increases; exponent		arru
5/8	←	Left arrow		arrl
5/9	↶	Anti-clockwise		arrac
5/10	↔	Mutually implies		arrlr
5/11	⇆	Left arrow over right arrow		lrarr
5/12	↦	Functional relationship		bararr
5/13	⇑	Double arrow, upward		darru or ^
5/14	⇐	Is implied by		darrl
5/15	∞	Infinity		infin
6/0	−	Minus		minus or −
6/1	⊃	Properly includes in set	Also: identical with	rhook
6/2	⊇	Contains as subset		rhkeq
6/3	∋	Contains		cont
6/4	⋂	Intersection of classes or sets between limits		hat
6/5	∃	There exists		reve
6/6	∅	Empty set		bararc
6/7	↓	Decreases		arrd
6/8	→	Approaches		arr

Table 3 *(continued)*

Position in table 1	Graphics	Name or meaning	Comments	Coding
6/9	↷	Clockwise		arrcc
6/10	↕	Vertical relationship		arrud
6/11	⇄	Right arrow over left arrow		rlarr
6/12	⇅	Anti-parallel		udarr
6/13	⇓	Double arrow, downward		darrd
6/14	⇒	Implies		darr
6/15	√	Radical	Also: square root	rad
7/0	′	Prime	Also: minutes, feet	prime or '
7/1	″	Double prime	Also: seconds, inches	dprime or ''
7/2	‴	Triple prime		trprime
7/3	∨	Logical or	Also: disjunction	checkd
7/4	∧	Logical and	Also: conjunction	checku
7/5	¬	Logical not		lognot
7/6	h	Planck constant		planck
7/7	⊢	Implies		imply
7/8	∫	Integral		int
7/9	∬	Double integral		dint
7/10	∭	Triple integral		trint
7/11	∂	Partial differentiation		prtl
7/12	$\hbar$	Planck constant divided by 2 π		plan2pi
7/13	ℵ	Aleph		aleph
7/14	○	Composite function	Also: small circle	cirsm

Table 3 *(continued)*

Position in table 2	Graphics	Name or meaning	Comments	Coding
2/1	⊕	Direct sum		crplus
2/2	⊖	Symmetric difference		crmin
2/3	⊗	Tensor product	Also: Dyadic product, or Plethysm operator	crtimes
2/4	⊙	Inner product	Used with tensors	crdot
2/5	∴	Therefore		thrf
2/6	∵	Because		beca
2/7	⊏	Image of		imbox
2/8	⊐	Original of		origbox
2/9	⊷	Image of		imline
2/10	⊶	Original of		origline
2/11	⊹	Hermitian conjugate matrix		herm
2/12	∔	Direct sum		dirsum
2/13	⌢	Most positive		mpos
2/14	≃	Homothetic		homot
2/15	≼	Element precedes under relation		elrel
3/0	≠	Not equal to		nequ
3/1	≒	Has an image		hasim
3/2	⟨	Open angle bracket, left		accbrale
3/3	⌊	Left floor	Paired with right floor, 4/3	lfloor
3/4	⋮	Triple colon		tripcol
3/5	⌈	Left ceiling	Paired with right ceiling, 4/5	lceil
3/6	⊑	Square subset		sqsub
3/7	⊔	Least upper bound	Used for lattices	lub
3/8	◁	Long triangle		ltril
3/9	≻	Is dominated by		cyrsim