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A PRELIMINARY PROPOSAL FOR ENCODING MAYAN HIEROGLYPHIC TEXT IN UNICODE

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Contents:

Background on the Mayan script, its origins and development

The Maya hieroglyphic script was developed by the ancient Maya civilization which flourished in southern Mesoamerica, on an area roughly the size of modern Germany, encompassing southeastern Mexico, Guatemala, Belize and Honduras.

Maya hieroglyphic texts and iconography were produced during the Classic- (ca. 250-900 AD) and the Postclassic- (ca. 1100-1519 AD) periods by the ancient lowland Maya civilization in Central America.

The earliest texts in the Maya region date from the Preclassic period around 300 BC and show influence of neighboring Isthmian/Epi-Olmec scribal traditions. However, Maya writing would fully flourish until the Classic period, between ca. AD 250-900, where hieroglyphs became widely used throughout the Mayan lowlands, at large cities such as Tikal, Calakmul, Copan and Palenque.

Then followed the Postclassic (ca. 1100-1520 AD), a phase of decline, depopulation and political turmoil, where only relatively few major Maya centers remained active, particularly in northern Yucatan. During the Postclassic, writing progressively became more restricted, and its practice became confined mostly to reading and producing the ancient Maya books or Codices. Although thousands of Maya books were confiscated and destroyed by Spanish clerical authorities, only three extant codices survive, preserved at libraries in Dresden, Madrid and Paris.

From the various Mesoamerican script systems, only Mayan has been deciphered to a satisfying extent, where about 70% to 80% of known texts can be read with confidence. Considerable progress has been made, however, in efforts to decipher the ancient scripts employed by the Aztec of central Mexico and the Mixtec in Oaxaca. Far less understood are the writing systems used at Teotihuacan, the Olmec and their likely successors, the Epi-Olmec or "Isthmian".

Three major factors that have proven crucial in attaining decipherment of Maya hieroglyphs were:
A sufficiently large corpus, comprising thousands of preserved text examples; Knowledge of the underlying language represented in the hieroglyphs; the presence of a bi-script, working like a "Rosetta-stone" type of key, which for Mayan is called "Landa's syllabary" , produced by 16th Century Spanish friar Diego de Landa with the aid of a Mayan scribe as his informant.

Earliest Mayan inscriptions appear largely in the highland Maya centers of Takalik Abaj, Kaminaljuyu, Chalchuapa and El Baúl and El Portón (of still unclear ethnolinguistic affiliation) as early as 400 BC. Among the first known lowland Maya inscriptions are those from San Bartolo, in the Peten rainforest, not far from the large centers of Xultun and Uaxactun (Guatemala), some of which have been dated to 300-200 BC. One of the earliest legible long-count dates is that recorded at Stela 29 from Tikal (Guatemala), where it was written 8.12.14.8.15 13 Men 3 Zip (July 6, 292 AD)

Figure 1. Maya region within Mesoamerica (Image source: Wikipedia.
(https://upload.wikimedia.org/wikipedia/commons/7/79/Mesoamerica_english.PNG)

Sources of Mayan hieroglyphic texts.

Sources used for defining Mayan hieroglyphs are at present four-fold:

1. **Codical sources:** This includes the three Mayan codices preserved at Dresden (Germany), Madrid (Spain) and Paris (France) all dating from the late Postclassic period (ca. 1250-1519 AD)
2. **Classic/Monumental sources:** this name refers to the extant sum of Mayan hieroglyphic inscriptions preserved on stone monuments and a number of other media (ceramic vessels, mural paintings, architectural elements, portable artifacts of bone, shell and wood, etc.), the vast majority of which belong to the Classic period (250-900 AD), and with the exception of the three Postclassic books above
3. **Catalog sources:** A growing number of hieroglyph catalogs producing over the course of history of research by various authors (Zimmermann 1956; Evreinov et al. 1961; Thompson 1962; Macri and Looper 2003; Macri and Vail 2009; Tokovinine 2017), and importantly, the work-in-progress NcodeX Project's own catalog (Pallan 2017) which includes a concordance of all of the above.
4. **Lexical sources:** To support translations of most Mayan terms into English, a large set of dictionaries and grammars representing those Mayan languages (extant and extinct) most closely related with hieroglyphic texts.

This proposal is based on both Codical and Catalog sources.

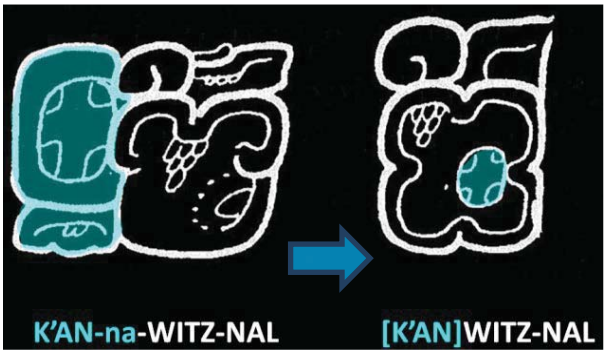
Structure of the script.

The Maya writing system is comprised of two main types of signs: logograms and syllables. Logograms are also called "word-signs", and were used to convey both sound and meaning, for instance, the sign for **B'A:LAM**, meaning "jaguar", is represented by the head of a feline. Ancient Maya scribes had at their disposal a sign repertoire comprising several hundred logographs, with which they could render significant terms of their ritual speech, including hundreds of nouns, verbal roots, adjectives, and adverbs.

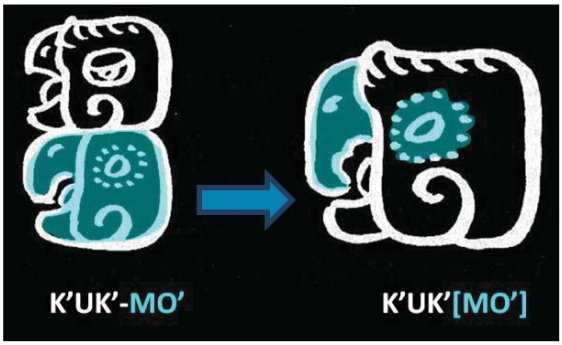
Syllables are signs which only convey sound, for instance, the same above term, *b'a:lam* for "jaguar", can be spelled out with the syllables **b'a**, **la** and **ma**, but the same /**b'a**/ sign was also used to spell

several other terms containing /b'a/ phonemes, including **b'a-ki**, meaning "bone" or even final /b'/ phonemes, such as **ka-b'a**, meaning "earth".

Within the Maya script, however, signs are not always merely "clustered" next or adjacent to each other. The script also makes use of conflation (merging of two signs together); superimposition (placing a sign in front of other partially "eclipsing" it); infixation (reducing a sign in size an inserting it into another); and pars pro toto (taking only a diagnostic feature of a sign and use it to represent the whole). These special modes of interaction between signs require implementation of special conventions and operators to account for the increased number of "joiners" attested in Mayan writing (see "K**ey to the conventions for specifying operators involved" in Appendix 2**).

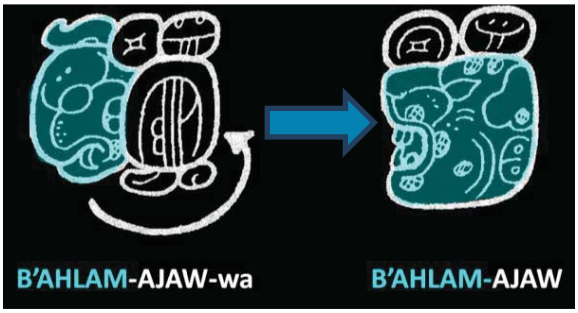


Infixation

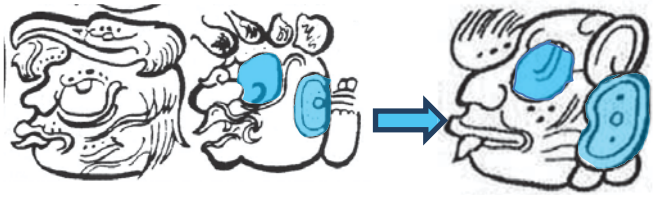


Conflation

Figure 2: Examples of Mayan script phenomena. (left) sign infixation; (right) sign conflation



Superimposition



Pars pro toto

Figure 3: Examples of Mayan script phenomena. (left)superimposition; (right) *pars pro toto*

Structure of the Codices.

The three codices share a common structure, including subdivisions into almanacs (thematic sections), frames, columns, rows, glyph-blocks, and individual graphemes. This information was incorporated into the database to help in analyzing the text.

Database structure.

The database comprises several interrelated tables, each offering specific functionalities that greatly facilitate the encoding process. The example below shows but one of these tables (BLOCKS_Autotransliterations), specifically used to semi-automatically assign specific transliteration and translation values to each glyph-block by grouping individual graphemes into "glyph strings" (i.e. **1511.514.94**) for the sequence **ya-AT-na**. This allows to match transliteration and translation values of

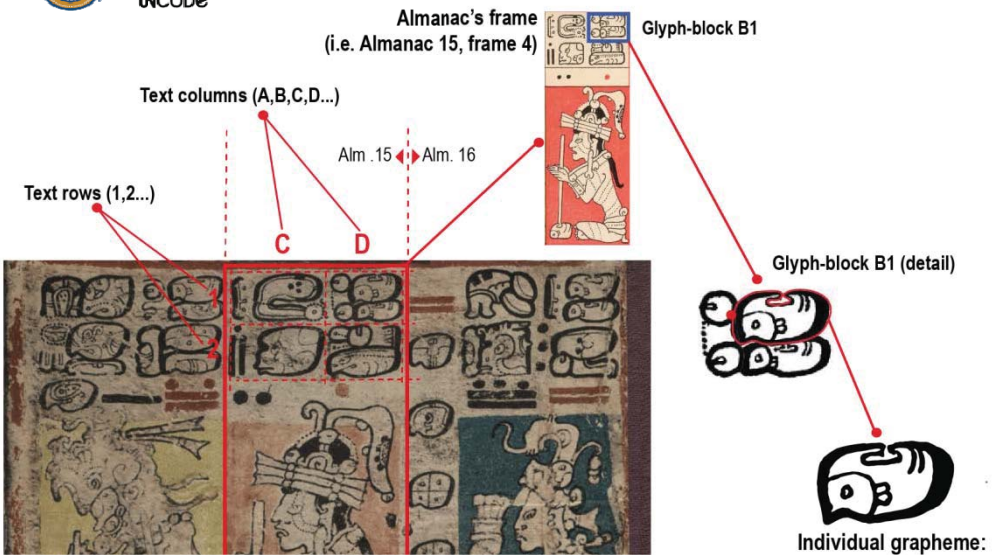


Figure 4: Dresden Codex. Middle register (b) of page 6 showing the last two frames (3-4) of Almanac 15 and the first frame of Almanac 16 (note transition between both marked by a vertical column of calendrics day signs). Elements highlighted are: text rows (1, 2…); text columns (A, B…), Frame 4 of Almanac 15, glyph

yatan, "the wife of" for both this given sequence and its attested "synonym glyph-strings" (i.e. **1511.514.1130**), which the database automatically overwrites upon them (thus dramatically reducing the time needed for researchers to manually transliterate and translate several thousand glyph blocks).

This database functionality (BLOCKS_Autotransliterations) also contains an interactive image of the frame where the glyph-block is located and highlights its position within the frame (to facilitate analyzing it in cotext). A further image shows a magnified view of the individual glyph-block. It automatically assigns a Column-Code-ID (i.e. **DRE_02a_F3**) which designates the specific block's location within the full corpus, comprising thousands of different texts. It also contains dial buttons which allow users to switch between different glyph-catalogs (i.e. Thompson 1962; Evreinov et al. 1961;Zimmermann 1956; Macri and Vail 2009, etc.), which modifies accordingly the values, catalog IDs and images shown at the repeating fields where each of the individual graphemes within the glyph block are separated and rearranged in linear fashion.

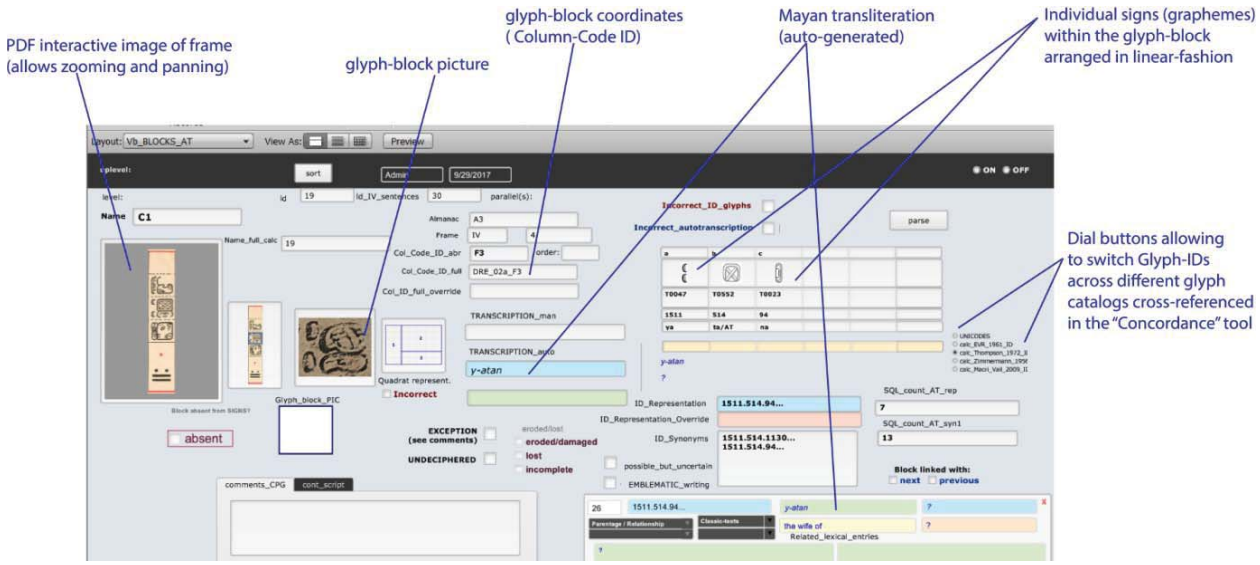


Figure 5. Database screenshot from the semi-automated Mayan transliteration and translation functionality

Sign Repertoire

A number of distinct signs (with distinct reading values) from the three codices is **552 signs**.
The breakdown is shown in **Table 1** below.

Codex:	DRESDEN	MADRID	PARIS
Number of extant pages	74 pages	112 pages	24 pages
Number of almanacs	96 (75 almanacs + 21 tables)	237 (almanacs & tables)	18 (almanacs & tables)
Number of frames	575 / 1659 total	889 / 1659 total	192 / 1659 total
Number of glyph-blocks	2951 / 7122 41.43%	3340 / 7122 total 46.89%	831 / 7122 total 11.66%
Blocks per frame ratio	5.13 blocks per frame	3.75 blocks per frame	4.32 blocks per frame
Number of graphemes (main-text signs, not counting purely calendric portions)	7208 / 17147 total 42.03%	7913 / 17147 total 46.14%	2026 / 17147 total 11.81%
Signs per glyph-block ratio:	2.442 signs per glyph-block	2.369 signs per glyph-block	2.438 signs per glyph-block

Table 1. Comparative statistics derived from analysis of three extant Mayan Codices

Quadrats

Quadrats are geometrized representations that describe how glyphs (or single signs) are joined to each other to conform a *grouping* (glyph-block) through various Mayan script dynamics (including rotation, resizing and various ligatures). The quadrats serve as a framework to hold from one up to six signs within each glyph block. In consultation with Unicode experts, a full mapping of all permutations shown by these sign-groupings or *quadrats*—sign-cluster arrangement and configuration possibilities—attested within the Mayan codices was deemed necessary as part of the encoding model and for rendering. The model compares to that for Egyptian (cf. the analysis of Egyptian quadrat types by Andrew Glass in L2/16-232). After analyzing the Dresden, Madrid and Paris codices, a total of **167** quadrat-types has been identified. A sample of the quadrats is shown in figure 6.

NOTE: For a more detailed listing of all quadrat types, ranked according to its importance (frequency of occurrence within the Mayan codices), please refer to Appendix 2.

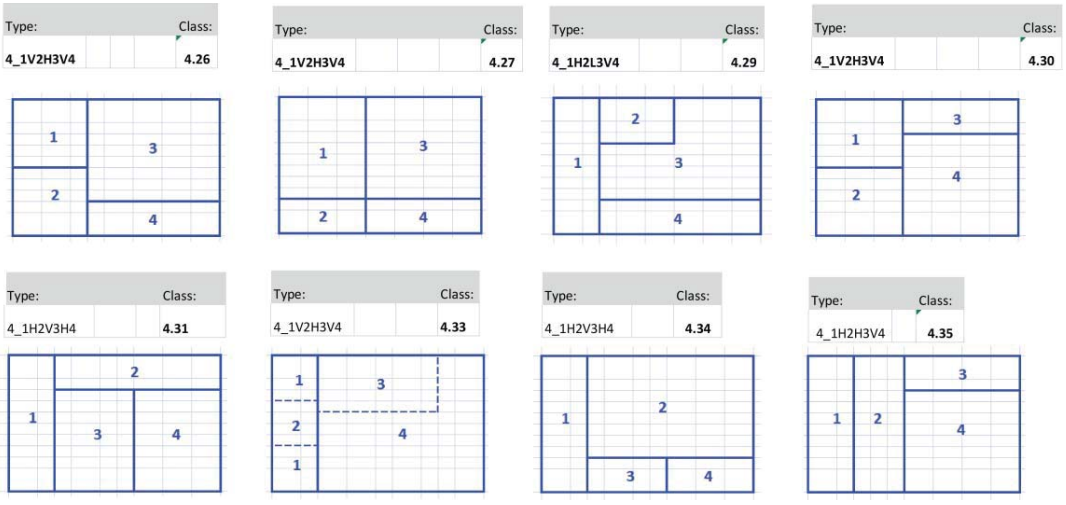


Figure 6. Example of "quadrats" (cluster-configuration arrangements) comprising eight glyph-blocks, Classes 4.26 to 4.35 from 167 currently defined after analyzing the Dresden, Madrid and Paris Codices.

Character names, order, and taxonomy

This section concerns the names of the characters, their ordering and the taxonomy used for creating the Project's codical glyph-catalog, aimed at addressing some of the main issues and palliating some of the deficiencies find in previous glyph-catalogues.

Based on Alan Gardiner's (1928) list originally developed for Egyptian, a similar number of categories were defined by the author, which also overlap semantically on many cases with Gardiner's list.

The new categories devised for Mayan are fully presented on **Table 3** below. Interestingly, while some of them are based on shape and others on function of the signs. This allows for a double interplay which could be beneficial, as over the history of research on Mayan decipherment, some signs have been better understood functionally than formally (and viceversa).

In order to better exploit this functional vs. formal contrast, a scheme of dual designation for most of the signs has been devised. In this manner, all signs belong to a primary category (indicated by an initial capital letter plus its ranking on it, i.e. R01), but most of them also pertain to a secondary one (indicated by a lowercase letter plus its ranking on it, i.e. y02). When designating signs through primary and secondary categories, there should be a clear hierarchical distinction, with the primary one exerting the strongest "pull" towards ascribing the particular sign into its orbit, be it by form or by function, while the second serves a complementary function (i.e. to further precise the sign's description).

This scheme provides the further advantage of allowing for neatly classifying poly-functional signs (i.e. those which can have differentiated functions when appearing on calendrics vs non-calendric contexts, etc.).

Sign font	Primary category	Secondary category	Combined Desgination:	Code point assigned:
	S01	y01	S01y01	U+15500
	S. Halved/elongated-open / narrow signs, mostly symmetrical (rotable)	Y.Functional/Grammatical (Affixes/ Suffixes/ Pronouns/Enclitics, etc		

Taxonomy

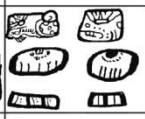
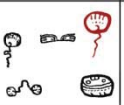
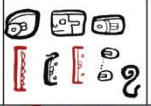
Importantly, new Digital Humanities functionalities were used as aides to develop this new classification, including previous work by the author in collaboration with the IDIAP Research Institute of Switzerland for Machine-Vision-based grouping of hieroglyphic signs based on recognition of their visual similarities.

In addition, the newly developed Project's database allows to rank signs according to their importance (i.e. frequency of usage for each of the above defined categories). Thus overall the catalog attempts to represent the relative importance of the signs, based on this rankings, as pertinent to each of the categories. As explained in the previous sections, the Mayan writing system typologically belongs to the family of logo-syllabic scripts. It is therefore important for the new catalog to reflect this functional distinction by providing differentiated treatments to each type of signs. Below are two of the methods followed to achieve this.

Syllables: Table 2 (parts 1-5) below present the updated Project's syllabary.

Logograms and syllables: Table 3 further below (Page 9) shows a preliminary presentation of the new taxonomy underlying the new Glyphary.

PROJECT NcodeX: Updated syllabary of Mayan codical hieroglyphic signs (v3)
by Carlos Pallán Gayol (January 17,2018)

	VOWELS	b'	ch	ch'	h	j	k	k'	l	m
a										
e										
i										
o										
u										

n	p	s	t	t'	tz	tz'	w	x	y

Table 2. NcodeX Project's updated syllabary o Mayan hieroglyphic signs.

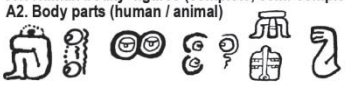
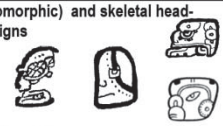
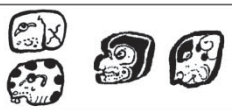
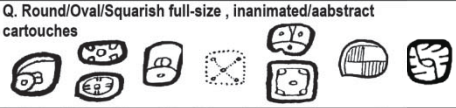
A1. Human bodily figures (complete, semi-complete) A2. Body parts (human / animal) 	K. Sky, Earth, Moon, Mountains, Water, Rain/Wind, Night, Day (Elements, Attributes, Natural forces, Cardinal directions, Colors and Natural landscape) 	TT.Broad Signs, OPEN, (horizontal, non-rotable) 
B. Anthropomorphic head-variants, parts of B-signs 	L. Architecture (cultural landscape) 	TTT. Broad Signs, iINERT/INANIMATE
C. Supernatural (Anthropozoomorphic) and skeletal head-variants, portions of C-class signs 	M. Large Objects (man-made) and Furniture 	U. Symmetrical / repeating segment signs (abstract) 
D. Skulls / Flayed / Underwordly entities 	N1. Small objects / instruments/ tools / weapons 	V. Asymmetrical / elongated non-repeating segment signs 
E. Hand Signs 	N2 (O). Attire, dress, ornamens 	W1. Calendric, bar-and-dots / zero variants, number head-variants 
F. Mammals (whole/parts) 	P. Food, Drink and Offerings 	X (W2). Calendric, day & month names, period-names, non bar-and-dots / non-zero 
G. Birds / Bats / feathers (whole / parts) 	Q. Round/Oval/Squarish full-size , inanimated/aabstract cartouches 	Y.Functional/Grammatical(Affixes/Suffixes/Pronouns/Enclitic, etc. 
H. Amphibious / Reptiles / turtles 	R. Halved/Closed Round/Oval/Squarish, mostly symmetrical 	Z. Unclassified / Problematic, Undetermined signs
I. Fish / Mollusks / Shells / Insects / Invertebrates and other animals 	S. Halved/elongated-open / narrow signs, mostly symmetrical (rotable) 	
J.-Trees / Plants / Foliation / flowers / seeds / grains /fruits / substenance/ edibles (non-animal origin) 	T. Broad Signs-Closed/Animated vars, low or high, mostly assymetrical (horizontal,non- rotable) 	

Table 3. Preliminary taxonomy employed on the Project's new Glyphary, specific for codical signs.

Properties

[to be filled in]

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Pallan Gayol, Carlos (2017) "Progress Report Milestone 4, until December 31, 2017"; internal report for the grant "Adopt a Character", project NcodeX; Unicode Consortium and Script Encoding Initiative (SEI), University of California at Berkeley, 7 pages; with Appendices "Ncodex_Glyphary_PDF_v06" (3 pages) and Quadrats_Class_sorted_Milestone4_v03" (7 pages)

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Acknowledgements

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APPENDIX 1. List of Characters (preliminary): Sample from NcodeX Project's "Glyphary" (glyph catalog) containing preliminary catalog codes and Unicode Code Points for ca. 250 Mayan codical hieroglyphic signs

Key to the column descriptions :

Column:	Name:	Explanation:
A.	ID Unique	This is a legacy value, specifying unique ID codes for a given sign across four of the cross-referenced glyph-catalogs of an earlier database table called ID_Photocatalog (i.e. ID 55)
B.	Variant	This is very important as several Mayan signs can be grouped by their variants. Variants typically share the sime above ID Unique code, however allographs usually require a differentiated ID code.
C.	GRAPHEME (font suggestion)	This column shows an image of the grapheme (individual sign) that corresponds to the ID code and can be interactively modified, allowing to switch from renditions across the various glyph-catalogues. By this means, it is possible to browse through different preliminary suggestions and visualizations towards creation of the final Open-type font (in collaboration with Andrew Glass).
D.	RANKING (frequency in Corpus)	This ranking is obtained through comprehensive SQL-queries and data-mining tools existing in the database, allowing to order the signs based on a representation of their relative importance and frequency of occurrence across the three Mayan codices. This ranking is both general (global) and specific for each of the Glyphary's suggested taxonomical categories.
E.	CONTEXT (example glyph-blocks)	This visualizations allow to see the grapheme from Col. B in context, showing a representative instance of how it may combine with other signs
F.	NcodeX GLYPHARY DESIGNATION (composite)	This is the dual designation, obtained by joining the primary and secondary classes assigned to the sign on columns H, I
G.	CODE POINTS (Unicode standard)	Once sorting and ranking for all codical signs has been determined, following the Glyphary's criteria, then code points following the Unicode standard can be assigned (i.e. from U+15500 to U+159FF)
F.	NcodeX (rep.) DESIGNATION	This column is redundant, allowing simply for manual editing/override of the above Column F (which is non-editable, but auto-generated by calculation)
H.	PRIMARY CLASS	Indicated by capital letter (i.e. R01) This is the first class (Glyphary code) assigned to the sign. The category that exerts a stronger "pull" to ascribe it into its orbit. It could be either a formal or a functional category.
I.	Secondary class	The secondary category is indicated by a lower case letter (i.e. y16), it works complementary, to further define a sign's description. Typically, it can be the opposite of the primary category (i.e. if primary is formal, then secondary functional or viceversa)
J.	PHONETIC VALUES OF SIGN: LOGOGRAMS vs. syllables	This colums show three slots, each for allowing multiple reading values (as several Mayan signs are polyvalent). Thus, primary, secondary and tertiary reading values can be shown.In Mayan transcription, LOGOGRAMS are indicated with Capital letters; syllables are indicated with lowercase letters.
K.	ENGLISH TRANSLATIONS OF LOGOGRAMS	Similar to the above column, the three slots from Column K show English translations that corresponds to the primary, secondary and tertiary meaningsof the logograms specified on Column J.

A. ID (Unique)	B. variant	C. GRAPHEME (font suggestion)	D. RANKING (frequency in Corpus)	E. CONTEXT (example glyph blocks)	F. NcodeX GLYPHARY DESIGNATION (composite)	G CODE POINTS (Unicode standard)	F. NcodeX (rep.) DESIGNATION	H. PRIMARY CLASS	I. Secondary class	J. PHONETIC VALUES OF SIGN: LOGOGRAMS vs. syllables	K. ENGLISH TRANSLATIONS OF LOGOGRAMS (primary, secondary and tertiary meanings)		
ID_Pho...	variant	NcodeX_Pict...	MATCH_ID_...	::Picture	NcodeX_man	UNICODE_C...	MANUAL_Pr...	MANUAL_Pr...	MANUAL_Se...	NcodeX_Phonetic_value1	TRANSLATION		
55			583		S01y01	U+15500	S01y01	S01	y01	u			
604			470		R01	U+15520	R01	R01		LE:M?	KAYWAK?		
205			428		V01y06	U+15540	V01y06	V01	y06	wa			
12275			367							K'UH			god
174			362		R01y02	U+15520	R03y02	R03	y02	ki			
10			356		S02y03	U+15501	S02y03	S02	y03	ka			
1133	v1		352		R02y04	U+15521	R02y04	R02	y04	li	LE:M?		resplendent
260			319		K01y08	U+155A0	K01y08	K01	y08	ja	UH?		moon
85	v1		317		V04y10	U+15543	V04y10	V04	y10	a?	AJ?		he/she of (AGN)
1130			316		R04y05	U+15523	R04y05	R04	y05	na			
12299			307		X02j02	U+15561	X02j02	X02	j02	K'IN			
459			303		X01j01	U+15560	X01j01	X01	j01	WA:J	O:L		tamale heart
145			289		D01x03	U+15580	D01x03	D01	x03	CHAM			
247			274		V02y07	U+15541	V02y07	V02	y07	AJAW	AJ?		lord/king he/she of
190			272		V03y09	U+15542	V03y09	V03	y09	ni			
454			265		X03k02	U+15562	X03k02	X03	k02	HA'			water rain
665			226		E01t01	U+155C0	E01t01	E01	t01	cha			
489			215		K03x04	U+155A2	K03x04	K03	x04	KAB'	CHAB'?		earth supervise
12297	v1		214		X05k04	U+15563	X05k04	X05	k04	ku	TU:N		stone
496			207		X06j03	U+15564	X06j03	X06	j03	NIK?	SA:K?	YATIK?	flower? seed?
22			203		O01v08	U+15540	O01v08	O01	v08	KOKA:J?	ITZAM?	ITZ?	bird deity
669			188		E02x07	U+155C1	E02x07	E02	x07	chi			
86			173		I01k07	U+15660	I01k07	I01	k07	YAX	yi		green/blue new
1721			170		W03	U+15602	W03	W03		OX	HUX		
240			164		V05j04	U+15544	V05j04	V05	j04	TI'			
1096			164							la			
484			158		X07a01	U+15565	X07a01	X07	a01	WINIK			person man
1008			153		D02		D02	D02		CHAM?	JOL?	UH?	death? skull?
1511			152		S04y12	U+15503	S04y12	S04	y12	ya			
510			150		X08q01	U+15566	X08q01	X08	q01	HA:B'	A:B'?		year time
12312			148							YAN?	AN?		
42			144		V06k05	U+15545	V06k05	V06	k05	SAK			white pure
90			142		Q02h02					mu			
218			138		S03y11	U+15502	S03y11	S03	y11	la			
12286			134		U01y13					b'a			
17			129		R05k06	U+15524	R05k06	R05	k06	CHAK			red great
514			129							ta	AT		
597			123		T03j05	U+15640	T03j05	T03	j05	le			
24	v1		114							UH-IXIK?	KAB'-IXIK?		moon lady? earth lady?
129			113		V07y13	U+15546	V07y13	V07	y13	ti			
12276	v1		99							NAL?	WINIK?		maize? / place? person?
159			99							TE'			
12278			99										
548			93		X09q02	U+15567	X09q02	X09	q02	TZ'AK			count order
921			93							AJAN?	NAL?		MAIZE GOD
1678	v1		89							ji			
21			89							??			
12310			88		K08q03	U+155A3	K08q03	K08	q03	CH'E:N?			cave?
524			88							CHAN	KA:N		sky heaven
49			82		J06y14	U+157A0	J06y14	J06	y14	yo			
521			78		K09y15	U+155A4	K09y15	K09	y15	b'a			
1722			77							KAN	CHAN		snake sky/four
1062			76							YAJ?			woe?
44			75			U+15502				yu			
1621			74							ta			
12308	v1		72							me			
235			62							o?			
365			61							sa			
61	v1		61							EK'			
1570			60							ma			
585	v1		59							pa			
1724			59							WAK			six

A. ID Unique	B. variant	C. GRAPHEME (font suggestion)	D. RANKING (frequency in Corpus)	E. CONTEXT (example glyph blocks)	F. NcodeX GLYPHARY DESIGNATION (composite)	G CODE POINTS (Unicode standard)	F. NcodeX (rep.) DESIGNATION	H. PRIMARY CLASS	I. Secondary class	J. PHONETIC VALUES OF SIGN: LOGOGRAMS vs. syllables			K. ENGLISH TRANSLATIONS OF LOGOGRAMS (primary, secondary and tertiary meanings)		
ID_Pho...	variant	NcodeX_Pict...	MATCH_ID_...	::Picture	NcodeX_man	UNICODE_C...	MANUAL_Pr...	MANUAL_Pr...	MANUAL_Se...	NcodeX_Phonetic_value1			TRANSLATION		
1012	v1		56							KISIN?					
27			56							OCH	TZA:B?		enter	rattle(s)	
11256			55							NOH	NOHOL		big	south	
50			54							K'A:K'	k'a?		fire		
1731			52							OXLAJU:N	HUXLAJU:N				
560			51							b'i	B'IH				
461			50							tzi					
666			50							k'a					
1727			50							B'OLO:N	B'ALU:N		nine	many	
1719			49							JU:N			one		
12353			49							K'AWI:L			lightning god	(God K)	
52			46							K'AN			yellow	precious	ripe
567	v1		46							WA'	tze		to stand up		
214			46							no					
998	v1		46							SIH?	PA'?	KAN??			
798			45							ch'o	si?				
1725			45							HUK			seven		
1726			45							WAXAK			eight		
12529			45							OTO:T			house		
133	v1		44							ITZAM?	XIW?	PAWAJ?	sorcerer?	lagarto/lizard	
12359			44							NA:H	XIB'?				
47			42							ko					
23			41							u	HUL?			to arrive?	
541			41							u					
265	v1		40							hi	SIHO:M				
1728			40							LAJU:N			ten		
46			39							i:K'			black		
12282			39							LOB'?			evil?	harm?	damage?
29			37							a	AJ			"he/she of" AGN)	
10121	v1		36												
11257	v1		35							O:K	YO:K	TZ'I'			
1730			33							LAJCHA'	KALAJU:N		twelve	twelve	
12304	v1		33							chu					
32			32			U+15541				wi					
26			32							CH'AK			to chop		
695			30							po					
12290			30							NA:M?			to hide		
82			29							AJ	a		he/she of (AGN)		
188			29							xa					
522	v1		29							tzu	JOP?				
48			29							TO:K'			flint		
37			29							e					
95			29							K'AL			to tie	to set	
1706			29							jo	CHI:T			father	
915			28							(JU:N) AJAW	AJAW		(one) lord	king	
306			28							XIB'?	A:T?	PAT?	man	man/ penis	back
136			27							HINA:J?					
1723			27							HO'			five		
748			27							O:N?	O:KIN?		familiar	relative	lineage
679			26							j					
557			25							mo					
11290	v1		24							TZ'AK			count	order	
1720			24												
20			23			U+15542				si					
12314	v1		23							CH'AM	YAL? /AL?	TAY?	take	cast? son of?	
959			23												
587			23							k'u					
40	v1		22							to					
457			21							AK'AB'			night	darkness	
468			21							PET	(Muluk)		round	encircle	
51			21							HA:L?			rain		
568			21							jo					

A. ID Unique	B. variant	C. GRAPHEME (font suggestion)	D. RANKING (frequency in Corpus)	E. CONTEXT (example glyph blocks)	F. NcodeX GLYPHARY DESIGNATION (composite)	G CODE POINTS (Unicode standard)	H. NcodeX (sup.) DESIGNATION	H. PRIMARY CLASS	. Secondary class	J. PHONETIC VALUES OF SIGN: LOGOGRAMS vs. syllables			K. ENGLISH TRANSLATIONS OF LOGOGRAMS (primary, secondary and tertiary meanings)		
ID_Pho…	variant	NcodeX_Pict…	MATCH_ID_…	::Picture	NcodeX_man	UNICODE_C…	MANUAL_Pr…	MANUAL_Pr…	MANUAL_Se…	NcodeX_Phonetic_value1			TRANSLATION		
12326			21							a	AJ			he/she of (AGN)	
80			20							u					
682	v1		20							CHUWA:J?			scorpion?		
1729			19							B'ULUK	B'ULUCH		eleven		
1734			19							WAKLAJU:N			sixteen		
499			19							na					
101	v3		18												
456			14							IK'			wind		
520			14							ma					
1732			14							CHANLAJU:N	KANLAJU:N		fourteen		
1737			14							B'OLONLAJU:N	B'ALU:NLAJU:N		nineteen		
12336			14							OCH?	E:M?		opposum?	racoon?	
41	v1		14							ta					
39	v1		13			U+15543				K'UH					
13			13							je	AKAN?			grass?/	
92			13							b'u					
241			13							mi	MIH			nothing	
855			13							MA:N?					
34			13							o					
12318			12							JOY			to encircle	to tie up	
38			12							tz'u					
12341			12							B'OLAY					
534			11							su					
593			11							TZ'AM?			throne?		
675			11							TAL			(num.class)		
1010			11							xi					
1733			11							HO'LAJU:N			fifteen		
12362			11							PAT					
626			10							MUY	MUYAL		cloud	cloudy	
919			10							CHAB'?-AJAW?	KAB'?-AJAW		earth lord?		
1031			10							AJ?		PUL?	he/she of (AGN)		
409			9							LOK			to emerge	to exit	
642			9							NIK	NIKTE'				
801			9							??					
1735			9							HUKLAJU:N	WUKLAJU:N		seventeen		
35			9							CHUM					
536			9							ta					
12348			9							ITZAM?-AHI:N?			God D-Alligator		
242			9												
1831	v3		8							tz'a					
787	v2		8							TZIKIN?					
1805			8							CHEL?	(IX)-CHEL?		Rainbow	Horizon	
11295			8							TZ'ONOT?	WAY		cenote	hole	
12289			7							sa?	wu/hu?				
997	v1		7							A:KAN	XIB'?		Howl? (God A')		
43			7							HU:N	JOY		headband	to enclose/bind	
477			7							u					
556			7							mo-lo			harvest?		
837			7							??					
1019			7							(I:K)CHUWA:J?			(Black) Scorpion?		
1074			7							??					
12315			7							CH'AM?					
12370			7							tz'a-pa			to plant		
573	v1		6							tz'a					
87			6							yi					
1829			6							KUY			owl		
613			6							PAKAL			shield		
318			6							k'i?	k'a?				
350			6							B'AJ?			to hammer		
739			6							MA:N?			Chikchan		
982			6							CHA:K			rain god		
1808			6												

A. ID Unique	B. variant	C. GRAPHEME (font suggestion)	D. RANKING (frequency in Corpus)	E. CONTEXT (example glyph-blocks)	F. NcodeX GLYPHARY DESIGNATION (composite)	G CODE POINTS (Unicode standard)	F. NcodeX (rep.) DESIGNATION	H. PRIMARY CLASS	I. Secondary class	J. PHONETIC VALUES OF SIGN: LOGOGRAMS vs. syllables			K. ENGLISH TRANSLATIONS OF LOGOGRAMS (primary, secondary and tertiary meanings)		
ID_Pho…	variant	NcodeX_Pict…	MATCH_ID_…	::Picture	NcodeX_man	UNICODE_C…	MANUAL_Pr…	MANUAL_Pr…	MANUAL_Se…	NcodeX_Phonetic_value1			TRANSLATION		
956			6							A:KAN			Howl		
1094			6							HU:J-WA:J					
18			5												
784			5							B'AH	b'a				
14	v2		5							ma					
19			5							che					
1717	v2		5							K'A:K'					
617			5							K'AN-A:K?			yellow turtle		
273			5							?	ti?				
552			5							WO:L?					
648			5												
754			5							KAY	ka		fish		
1736			5							WAXAKLAJU:N			eighteen		
5050			5							JEL?	??				
12526			5							yi-chi			its surface? /face?		
54			4							CH'OK			youth		
11284			4							KUY			owl		
170			4							TAL?	nu?				
576			4							no					
659			4							SUHUY?			whirpool?		
830	v1		4							xu?	SU:TZ?			bat	
1020			4							??					
1161			4							??					
10119			4							TZ'AK-hi			it was counted/ordered?		
288			4							JU:B'?	he		conch		
11261			4							LO:T?			twins	hunchback	
300			3							k'o					
487			3							HIX			jaguar		
1086			3							MA:K?	KO:K?		enclosure		
28			3							AJ?	SIH?		"he/she of"?	to be born	
828			3							?					
849			3							??					
12346			3												
546			3							WA:Y?			sorcerer		
1500			3							te					
833			3							AHI:N			alligator		
12343			3							TZUL?	PE:K'?		dog		
928	v1		2												
1714			2							PIK?			skirt		
1826			2							u	MUWA:N?			hawk?	
612			2							??					
15			2							he?					
91			2							??					
513			2							K'AN-JAL					
744			2							??					
846			2							??					
1024			2							SIB'IKTE'?			Pax God?		
1027			2							WAK			six		
1716			2							CHUWEN?			monkey scribe		
1809			2							?					
1811			2												
11259			2							O:M?					
12285			2							HINA:J?	tzi?		sporut?		
12349			2							K'INICH			resplendent		
12369			2							tz'a-ta?					
12331			2												
12331			2							K'UCH	TA:HOL		vulture	vulture	
1059	v2		1							UH?	u				
1059			1							UH?	u				
349	v2		1												
13001	v5		1							chu.ku?	MUK?		capture?	tomb?	
10117			1							chi-K'IN			west		

A. ID Unique	B. variant	C. GRAPHEME (font suggestion)	D. RANKING (frequency in Corpus)	E. CONTEXT (example glyph blocks)	F. NcodeX GLYPHARY DESIGNATION (composite)	G. CODE POINTS (Unicode standard)	F. NcodeX (rep.) DESIGNATION	H. PRIMARY CLASS	I. Secondary class	J. PHONETIC VALUES OF SIGN: LOGOGRAMS vs. syllables			K. ENGLISH TRANSLATIONS OF LOGOGRAMS (primary, secondary and tertiary meanings)		
ID_Pho…	variant	NcodeX_Pict…	MATCH_ID_…	::Picture	NcodeX_man	UNICODE_C…	MANUAL_Pr…	MANUAL_Pr…	MANUAL_Se…	NcodeX_Phonetic_value1			TRANSLATION		
383			1							b'e	b'i				
463			1							CHAM?	KIMI?				
559			1							B'EN?			reed?		
740			1							YATIK?			flower?		
794			1							TI'?			mouth?		
1083			1							??					
1110			1							u					
1754			1							KIB'?					
1814			1							LAJU:N?					
1816			1							?					
1827			1							KAY?	KANKAY ?		fish	eel	
1828			1							??					
1878			1							ti-CHAN			in the sky?		
2230			1							MU:T?-ITZAM?			Bird Itzamna		
12329			1							K'UCH	TA:HOL		vulture	vulture	
12892			1							tz'o?					
12893			1							tz'e??					
45			0		V08y15					tu					
644			0		H01t02	U+15620	H01t02	H01	t02	MU:K?	mu		augury		
749			0							O:N?	OK'IN?		relative of		
795	v1		0							CHAN	KA:N				
944			0		C01	U+155E0	C01	C01		K'UH			god	holy	
958			0							(IX)-UH	UH	ja	(lady) moon		
1079			0												
1025			0							IK'?-(K'UH)	PIKIT??				
685			0							UH? /UW?	WINA:K		moon	twenty	
789			0							pe?	TUL?	CHI:T?		rabbit?	
12301	v2		0							chu					
726	v2		0							pa					
12988			0							??					
12999	v3		0							chu					
13000	v4		0							??					
12			0												
12274	v1		0							K'UH			god		
12525			0							pa					
83			0							u					
12368			0							tze					
12367			0							tze	se				
1616			0							ch'a	CH'A:J			droplets/incense	
1684			0							UH?			moon	breath	
1685			0							ne					
171			0							o					
1061			0							to					
555			0							lo					
532			0												
12294			0							K'IN-NA:M					
12352			0							ITZAM?			sorcerer? /alligator?		
11293	v2		0							SU:TZ?	xu		bat		
12361			0												
53	v2		0							ta					
1091			0												
12324			0							K'AL			to tie/fasten		
1003			0							A:KAN?			Howl		
1029			0							XIW?-TU:N					
1077			0							JU:B?			conch		
1711	v2		0							NAL?	WINIK?		maize/place	person	
1746			0							LAMAT?	EK'		Lamat	star	
1821			0							PA'?			split	cleft	
1833			0							HU:J-WA:J					
12292			0												

APPENDIX 2. List of Quadrats: showing ca. 167 quadrats arranged by Class, in order of complexity.

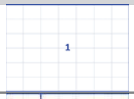
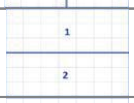
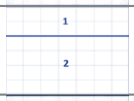
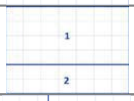
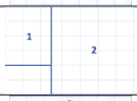
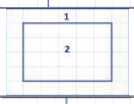
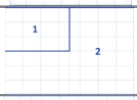
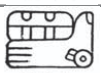
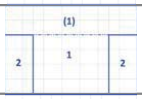
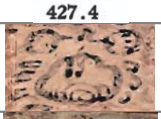
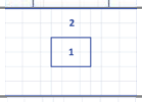
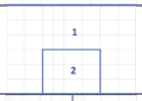
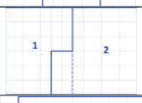
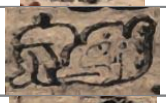
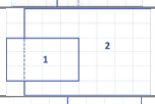
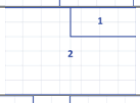
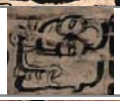
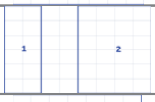
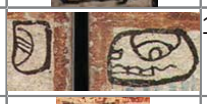
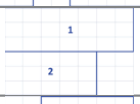
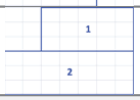
The following section lists ca. the 167 quadrat types defined after extensive research on all the main textual portions of the Mayan codices (Dresden, Madrid and Paris) was conducted during 2017. As shown in **Table 1** above, this required analyzing 7,122 glyph-blocks (2951, 3340 and 831 for the Dresden, Madrid and Paris codices respectively).

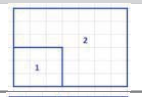
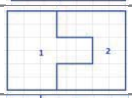
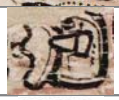
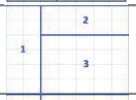
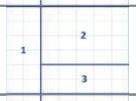
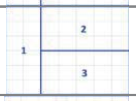
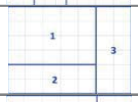
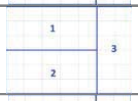
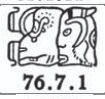
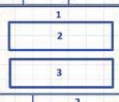
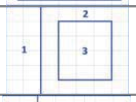
Key to the conventions for specifying operators involved:

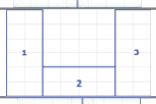
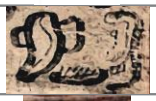
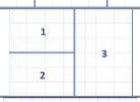
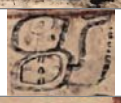
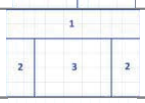
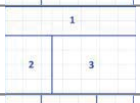
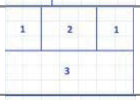
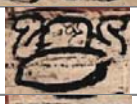
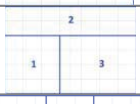
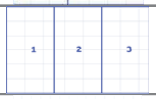
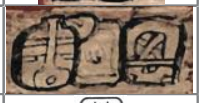
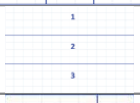
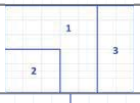
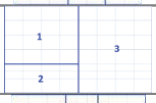
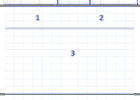
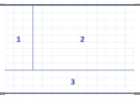
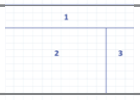
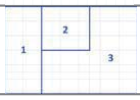
MEMBERS / SIGNS within GLYPH-BLOCKS:		
a	**1**	Member a, sign 1. Elongated “peripheral sign”
A	**11**	Member A, sign 1: large “core” sign
b	**2**	Member b, sign 2. Elongated “peripheral sign”
B	**22**	Member B, sign 2: large “core” sign
c	**3**	Member c, sign 3. Elongated “peripheral sign”
C	**33**	Member C, sign 3: large “core” sign
d	**4**	Member d, sign 4. Elongated “peripheral sign”
D	**44**	Member D, sign 4: large “core” sign
e	**5**	Member e, sign 5. Elongated “peripheral sign”
E	**55**	Member E, sign 5: large “core” sign
f	**6**	Member f, sign 6. Elongated “peripheral sign”
F	**66**	Member F, sign 6: large “core” sign
g	**7**	Member g, sign 7. Elongated “peripheral sign”
G	**77**	Member G, sign 7: large “core” sign
JOINERS		
.	**H**	horizontal join
:	**V**	vertical join
[	**L**	Ligature normal (indeterminate/general conflation between signs 1 and 2)
»	**I**	Infixation normal (sign 1 reduced and infixed into sign 2 in reading order)
«	**II**	Infixation normal (sign 1 reduced and infixed into sign 2 in reading order)
ˆ	**S**	superimposition normal (sign 1 superimposed over sign 2)
ˇ	**SI**	Superimposition inverted (i.e. sign 2 (in reading order) superimposed over sign 1)
°	**R**	Reduction, sign 1 reduced but not infixed into sign 2)
((	**))**	Asymetric halves, half 1 reduced as compared to half 2 of quadrat)
∞	**DI**	["∞" ; "DI"] // Dyslocated cluster, significant empty space separating two or more signs normally joined)

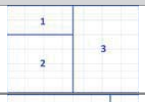
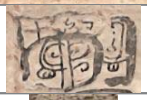
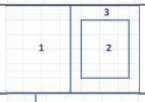
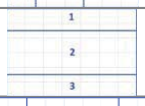
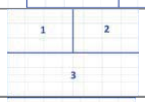
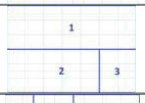
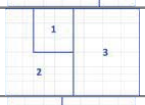
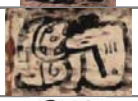
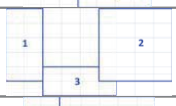
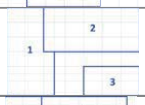
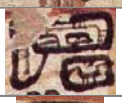
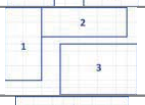
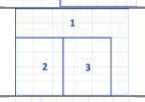
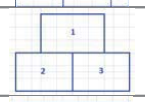
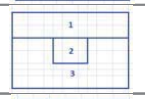
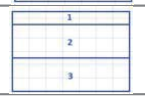
Key to the column descriptions :

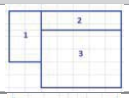
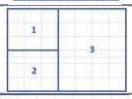
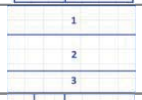
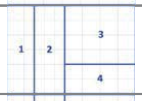
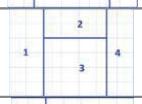
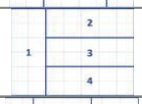
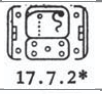
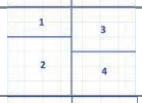
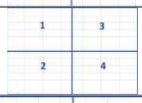
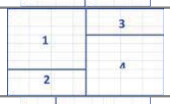
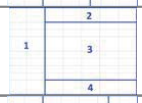
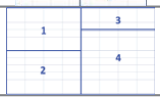
Column:	Name:	Explanation:
A.	CLASS	Class describes each of the quadrat types precisely by means of three digits (i.e. 3.12). First digit (type): Groups by number of members (i.e. "3" means three graphemes inside the glyph block, or "type-3 quadrats") Second digit (variety): is a consecutive digit specifying which of the precise varieties within each of the types (i.e. there are 21 different varieties within the Type-2 quadrats)
B.	RANKING	Indicates how many times that particular quadrat is attested within the Mayan codices, thereby providing a measurement of their relative importance within late Postclassic scribal traditions across the Yucatan peninsula
C.	QUADRAT DIAGRAM	A geometric representation (simplified) showing the basic arrangement of the signs and how they are joined with one another. It also reflects the most plausible reading order of members within the block
D.	EXAMPLE FROM CODICES	Shows representative examples from attested glyph blocks across all the three codices
E.	NUMERIC GENERAL DESCR.	In numeric descriptions, members are specified with numbers (1,2,3). Joiners are specified with the letter conventions provided above (i.e. "V" for vertical join; "H" for horizontal join; "L" for ligature). No distinction between "core" and "peripheral" signs at this level. Much broader categories.
F.	LETTER GENERAL DESCR. (Auto-generated from E)	In „letter" description (legacy conventions), members take latters (a,b,c…). Elongated "peripheral" signs take lowercase letters while large "core" signs take capital letters (A, B, C). Joiners are specified with symbols, largely based on the *Manuel de Codage* and other standards specific to Mayan epigraphy (as indicated on the "Key to conventions used" above)". No distinction between "core" and "peripheral" signs at this level. Much broader categories.
G.	LETTER SPECIFIC DESCR.	Same as Column F, albeit describing much more precisely the nature of the signs and the joiners being used with the "letter" system. Elongated "peripheral" signs take lowercase letters while large "core" signs take capital letters (A, B, C). Joiners are specified with symbols (as indicated on the "Key to conventions used" above)".
F.	NUMERIC SPECIFIC DESCR. (Auto-generated from G)	Same as Column E, albeit describing much more precisely the nature of the signs and the joiners being used with the "numeric system". Joiners are specified with letters (as indicated on the "Key to conventions used" above)".

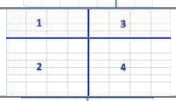
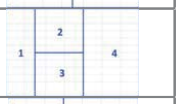
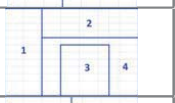
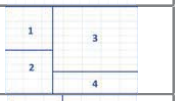
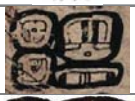
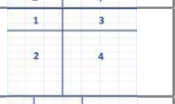
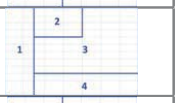
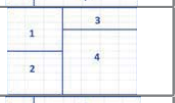
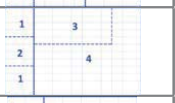
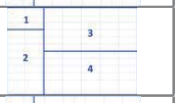
A. CLASS	B. RANKING	C. QUADRAT DIAGRAM	D. EXAMPLE FROM CODICES	E. NUMERIC GENERAL DESCR.	F. LETTER GENERALDESCR	G. LETTER SPECIFIC DESCR.	H. NUMERIC SPECIFIC DESCR.
Class	SQL_...	Quadrat_type...	Quadrat_exa...	Joiner_repre...	Joiner_st...	Joiner_repr...	Joiner_str_calc_p...
1.01	340			1	a	A	11
2.01	668		 1.1a	1H2	a.b	a.B	1H22
2.02	248		 345.5	1H2	a.b	A.b	11H2
2.03	105		 17.	1H2	a.b	A.B	11H22
2.04	112		 34 6	1V2	a:b	A:B	11V22
2.05	97		 M.p36d.18	1V2	a:b	a:B	1V22
2.06	68		 50.1	1V2	a:b	A:b	11V2
2.07	11			1H2	a.b	(A°).B	(11R)H22
2.08	16		 142.10	1L2	a[b	A«B	11II22
2.09	2		 427.4	1L2	a[b	AˇB	11SI22
2.10	2			1L2	a[b	AˇB	11SI22
2.11	26			1L2	a[b	AˆB	11S22
2.12	6			1L2	a[b	A«b	11II2
2.13	2			1L2	a[b	Aˇb	11SI2
2.14	1			1L2	a[b	a»B	1I22
2.15	3			1H2	a.b	(A).((B))	(11)H))22))
2.16	2			1L2	a[b	a»B	1I22
2.17	2			1H2	a.b	a.∞B	1HDI22
2.18	2			1V2	a:b	A:(B°)	11V(22R)
2.19	0			1V2	a:b	(A°):(B)	(11R)V(22)

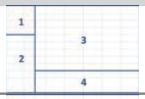
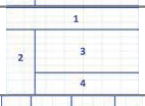
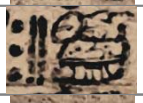
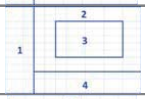
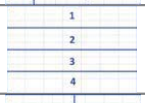
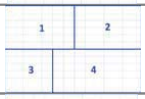
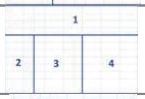
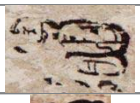
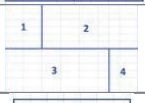
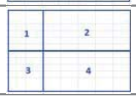
A. CLASS	B. RANKING	C. QUADRAT DIAGRAM	D. EXAMPLE FROM CODICES	E. NUMERIC GENERAL DESCR.	F. LETTER GENERALDESCR	G. LETTER SPECIFIC DESCR.	H. NUMERIC SPECIFIC DESCR.
Class	**SQL_...**	**Quadrat_type...**	**Quadrat_exa...**	**Joiner_repre...**	**Joiner_st...**	**Joiner_repr...**	**Joiner_str_calc_p...**
2.20	**0**			1L2	**a[b**	a»B	**1I22**
2.21	**1**			1L2	**a[b**	aˆB	**1S22**
3.01	**166**		 1.3.1	1H2V3	**a.b:c**	a.(b:C)	**1H(2V33)**
3.02	**642**		 1.8.1	1H2V3	**a.b:c**	a.(B:c)	**1H(22V3)**
3.03	**144**		 1a.9.1	1H2V3	**a.b:c**	a.(B:C)	**1H(22V33)**
3.04	**88**			1V2H3	**a:b.c**	a:(B.C)	**1V(22H33)**
3.05	**58**		 145a.1.1	1H2H3	**a.b.c**	a.B.c	**1H22H3**
3.06	**12**		 14.12	1H2H3	**a.b.c**	a.b.C	**1H2H33**
3.07	**106**		 10.5.1	1V2H3	**a:b.c**	(A:b).c	**(11V2)H3**
3.08	**37**		 9.3.1	1V2H3	**a:b.c**	(A:B).c	**(11V22)H3**
3.09	**93**		 25.1.3	1V2H3	**a:b.c**	(a:B).c	**(1V22)H3**
3.10	**5**		 31a.14.1	1H2H3	**a.b.c**	A.B.c	**11H22H3**
3.11	**43**		 81.1.1a	1H2V3	**a.b:c**	A.(B:c)	**11H(22V3)**
3.12	**8**		 76.7.1	1H2H3	**a.b.c**	a.B.C	**1H22H33**
3.13	**1**		 322.3.1 D.26.b.1	1(2V3)	**a(b:c)**	A«(b:c)	**11II(2V3)**
3.14	**18**		 33.1	1H2L3	**a.b[c**	a.(B«C)	**1H(22II33)**
3.15	**2**			1H2L3	**a.b[c**	a.(B«c)	**1H(22II3)**
3.16	**6**		 357.3.2	1H2H3	**a.b.c**	A.b.c	**11H2H3**
3.17	**20**		 345.10.1a D.47.c.2 D.47.e.2	1H2V3	**a.b:c**	A.(B:C)	**11H(22V33)**
3.18	**33**		 1.10a.1	1H2V3	**a.b:c**	(A.B):c	**(11H22)V3**

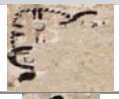
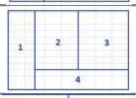
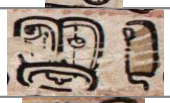
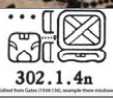
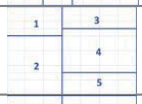
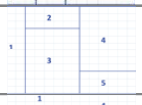
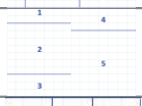
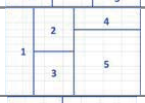
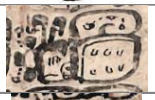
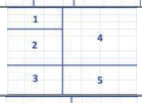
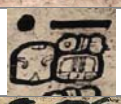
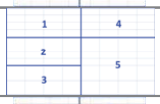
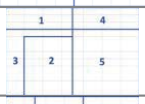
A. CLASS	B. RANKING	C. QUADRAT DIAGRAM	D. EXAMPLE FROM CODICES	E. NUMERIC GENERAL DESCR.	F. LETTER GENERALDESCR	G. LETTER SPECIFIC DESCR.	H. NUMERIC SPECIFIC DESCR.
Class	SQL_...	Quadrat_type...	Quadrat_exa...	Joiner_repre...	Joiner_st...	Joiner_repr...	Joiner_str_calc_p...
3.19	3		 23.3.3	1H2V3	a.b:c	A.(b:C)	11H(2V33)
3.20	1			1H2H3	a.b.c	a.b.c	1H2H3
3.21	33			1V2H3	a:b.c	(A:B).C	(11V22)H33
3.22	8			1V2L3	a:b[c	a:(BˆC)	1V(22S33)
3.23	2		 1.19.1	1V2H3	a:b.c	a:(b.C)	1V(2H33)
3.23	3			1H2V3	a.b:c	b:(a.C)	2V(1H33)
3.23	2			1V2H3	a:b.c	a:(b.C)	1V(2H33)
3.24	4			1L2V3	a[b:c	(AˆB):C	(11S22)V33
3.25	1			1H2V3	a.b:c	A.(b:C)	11H(2V33)
3.26	4			1H2H3	a.b.c	A.B.C	11H22H33
3.27	1		 2.7	1V2V3	a:b:c	A:B:C	11V22V33
3.28	2			1L2H3	a[b.c	(AˇB).c	(11SI22)H3
3.29	7			1V2H3	a:b.c	(A:b).C	(11V2)H33
3.30	2			1H2H3	a.b.c	A.b.C	11H2H33
3.31	2		 431.6.1	1H2V3	a.b:c	(a.b):C	(1H2)V33
3.32	2		 2.8.1	1V2V3	a:b:c	A:B:c	11V22V3
3.33	7		 3.5.1	1H2V3	a.b:c	(a.B):c	(1H22)V3
3.34	10			1V2H3	a:b.c	a:(B.c)	1V(22H3)
3.35	2		 4.2.1	1V2V3	a:b:c	a:b:C	1V2V33
3.36	8			1H2L3	a.b[c	A.(b»C)	11H(2I33)

A. CLASS	B. RANKING	C. QUADRAT DIAGRAM	D. EXAMPLE FROM CODICES	E. NUMERIC GENERAL DESCR.	F. LETTER GENERALDESCR	G. LETTER SPECIFIC DESCR.	H. NUMERIC SPECIFIC DESCR.
Class	**SQL_...**	**Quadrat_type...**	**Quadrat_exa...**	**Joiner_repre...**	**Joiner_st...**	**Joiner_repr...**	**Joiner_str_calc_p...**
3.37	**5**			1V2H3	**a:b.c**	(a:B).C	**(1V22)H33**
3.38	**1**			1L2H3	**a[b.c**	(a[B).c	**(1L22)H3**
3.39	**1**			1H2V3	**a.b:c**	(A.b):c	**(11H2)V3**
3.40	**4**			1H2L3	**a.b[c**	A.(B»C)	**11H(22I33)**
3.41	**1**			1H2L3	**a.b[c**	a.(C«D)	**1H(33II44)**
3.42	**8**			1V2V3	**a:b:c**	a:B:c	**1V22V3**
3.43	**1**			1L2H3	**a[b.c**	(A˘B).c	**(11SI22)H3**
3.44	**2**		 1.10a.1	1H2V3	**a.b:c**	(A.B):C	**(11H22)V33**
3.45	**4**			1V2H3	**a:b.c**	(A):(B.c)	**(11)V(22H3)**
3.46	**0**			1L2H3	**a[b.c**	(A):(B.c)	**(11)V(22H3)**
3.47	**2**			1H2V3	**a.b:c**	A.(B:c)	**11H(22V3)**
3.48	**1**			1H2V3	**a.b:c**	A.(∞B:c)	**11H(DI22V3)**
3.49	**1**			1H2V3	**a.b:c**	A:(B:∞c)	**11V(22VDI3)**
3.50	**1**			1H2V3	**a.b:c**	a:(b:∞C)	**1V(2VDI33)**
3.51	**1**			1H2V3	**a.b:c**	A:(B.C)	**11V(22H33)**
3.52	**1**			1V2H3	**a:b.c**	A:(B.C)	**11V(22H33)**
3.52	**1**			1V2L3	**a:b[c**	a:(B»C)	**1V(22I33)**
3.53	**0**			1H2V3	**a.b:c**	(a.B):c	**(1H22)V3**
3.54	**1**			1L2V3	**a[b:c**	(a»B):c	**(1I22)V3**
3.55	**1**			1V2V3	**a:b:c**	(a:B:C)	**(1V22V33)**

A. CLASS	B. RANKING	C. QUADRAT DIAGRAM	D. EXAMPLE FROM CODICES	E. NUMERIC GENERAL DESCR.	F. LETTER GENERALDESCR	G. LETTER SPECIFIC DESCR.	H. NUMERIC SPECIFIC DESCR.
Class	SQL_...	Quadrat_type...	Quadrat_exa...	Joiner_repre...	Joiner_st...	Joiner_repr...	Joiner_str_calc_p...
3.56	1			1H2V3	a.b:c	(a).(b:C)	(1)H(2V33)
3.57	1			1V2H3	a:b.c	(A):(B.C)	(11)V(22H33)
3.58	2			1V2H3	a:b.c	(A:):((C))	(11V)V))33))
3.59	1			1V2V3	a:b:c	A:B:c	11V22V3
4.01	15		 302a.3.3	1H2H3V4	a.b.c:d	a.b.(C:d)	1H2H(33V4)
4.02	6		 302.9.3	1H2H3V4	a.b.c:d	a.b.(C:D)	1H2H(33V44)
4.03	1		 427.9.2	1H2V3H4	a.b:c.d	a.(b«C).d	1H(2II33)H4
4.04	13		 351.1.1 D.p26a.3	1H2V3H4	a.b:c.d	a.(b:C).d	1H(2V33)H4
4.05	7		 322.1.2	1H2V3V4	a.b:c:d	a.(b:c:d)	1H(2V3V4)
4.06	3		 11.4.3na	1H2V3H4	a.b:c.d	a.(B:c).D	1H(22V3)H44
4.07	12		 17.7.2*	1H2V3H4	a.b:c.d	a.(B:C).d	1H(22V33)H4
4.08	3		 302.1.4n	1V2H3V4	a:b.c:d	(a.B).(C.d)	(1H22)H(33H4)
4.09	3		 4.15.9	1V2H3V4	a:b.c:d	(a:B).(C:D)	(1V22)H(33V44)
4.10	8		 356.5.1	1V2H3V4	a:b.c:d	(A:B).(C:D)	(11V22)H(33V44)
4.11	0		 93.8.1	1V2H3V4	a:b.c:d	(A:b).(c:D)	(11V2)H(3V44)
4.12	1		 11.4.3n	1H3V2V4	a.c:b:d	a.C:(B.D)	1H33V(22H44)
4.13	6		 11.2.7	1H2V3V4	a.b:c:d	a.(b:C:D)	1H(2V33V44)
4.14	9		 6.8.2n	1H2V3H4	a.b:c.d	a.(B:c).d	1H(22V3)H4
4.15	10		 11.2.10	1V2H3V4	a:b.c:d	(A:B).(C:d)	(11V22)H(33V4)
4.16	4		 307.8.1	1V2H3V4	a:b.c:d	(A:B).(c:D)	(11V22)H(3V44)

A. CLASS	B. RANKING	C. QUADRAT DIAGRAM	D. EXAMPLE FROM CODICES	E. NUMERIC GENERAL DESCR.	F. LETTER GENERALDESCR	G. LETTER SPECIFIC DESCR.	H. NUMERIC SPECIFIC DESCR.
Class	**SQL_...**	**Quadrat_type...**	**Quadrat_exa...**	**Joiner_repre...**	**Joiner_st...**	**Joiner_repr...**	**Joiner_str_calc_p...**
4.17	**1**		 1.1.1	1H2H3V4	**a.b.c:d**	A.((B.c):D)	**11H))22H3)V44)**
4.18	**2**			1H2V3H4	**a.b:c.d**	((a.B):C).d)	**))1H22)V33)H4)**
4.19	**1**		 1.26.1	1V2H3V4	**a:b.c:d**	(a:B):(c.D)	**(1V22)V(3H44)**
4.19	**1**			1V2H3V4	**a:b.c:d**	(a:B):(c.D)	**(1V22)V(3H44)**
4.20	**1**			1H2V3H4	**a.b:c.d**	(a.B).(c.D)	**(1H22)H(3H44)**
4.21	**3**			1V2H3V4	**a:b.c:d**	(A:B).((C:D))	**(11V22)H))33V44))**
4.22	**10**			1H2V3L4	**a.b:c[d**	A.(b:(C^D))	**11H(2V(33S44))**
4.24	**16**		 1.23.2	1V2H3V4	**a:b.c:d**	(A.b).(C.d)	**(11H2)H(33H4)**
4.25	**2**		 4.9.4	1V2H3V4	**a:b.c:d**	a:(b.c):d	**1V(2H3)V4**
4.26	**8**			1V2H3V4	**a:b.c:d**	(a.b).((C.d))	**(1H2)H))33H4))**
4.27	**4**			1V2H3V4	**a:b.c:d**	(A:b).((C.d))	**(11V2)H))33H4))**
4.28	**2**			1V2H3V4	**a:b.c:d**	(a:B).((c.D))	**(1V22)H))3H44))**
4.29	**2**			1H2L3V4	**a.b[c:d**	a.(b»C:d)	**1H(2I33V4)**
4.30	**1**			1V2H3V4	**a:b.c:d**	(A:B).((c:D))	**(11V22)H))3V44))**
4.31	**3**			1H2V3H4	**a.b:c.d**	a.(b:(C.D))	**1H(2V(33H44))**
4.32	**1**			1L2H3L4	**a[b.c[d**	(a»b).(C»D)	**(1I2)H(33I44)**
4.33	**1**			1V2H3V4	**a:b.c:d**	(a:b).(C:D)	**(1V2)H(33V44)**
4.34	**8**			1H2V3H4	**a.b:c.d**	a.(B:(c.d))	**1H(22V(3H4))**
4.35	**6**			1H2H3V4	**a.b.c:d**	a.b.(c:D)	**1H2H(3V44)**
4.36	**5**			1V2H3H4	**a:b.c.d**	a:(b.C.d)	**1V(2H33H4)**

A. CLASS	B. RANKING	C. QUADRAT DIAGRAM	D. EXAMPLE FROM CODICES	E. NUMERIC GENERAL DESCR.	F. LETTER GENERALDESCR	G. LETTER SPECIFIC DESCR.	H. NUMERIC SPECIFIC DESCR.
Class	**SQL_...**	**Quadrat_type...**	**Quadrat_exa...**	**Joiner_repre...**	**Joiner_st...**	**Joiner_repr...**	**Joiner_str_calc_p...**
4.37	**2**			1V2H3V4	**a:b.c:d**	(a:b).(C:d)	**(1V2)H(33V4)**
4.38	**2**			1V2H3V4	**a:b.c:d**	a:(b.(C:d))	**1V(2H(33V4))**
4.39	**1**			1H2L3H4	**a.b[c.d**	a.(B»C).d	**1H(22I33)H4**
4.40	**3**			1H2V3V4	**a.b:c:d**	a.(B:C:d)	**1H(22V33V4)**
4.41	**1**			1H2L3H4	**a.b[c.d**	a.(B»C).d	**1H(22I33)H4**
4.42	**1**			1H2V3L4	**a.b:c[d**	(a.b).(C»D)	**(1H2)H(33I44)**
4.43	**2**			1L2V3H4	**a[b:c.d**	((A»B):c).d	**))11I22)V3)H4**
4.44	**1**			1H2V3H4	**a.b:c.d**	a.(b:(c.D))	**1H(2V(3H44))**
4.45	**1**			1H2L3V4	**a.b[c:d**	a.((B»C):d)	**1H))22I33)V4)**
4.46	**0**			1H2L3V4	**a.b[c:d**	a.((B»C):d)	**1H))22I33)V4)**
4.47	**0**			1V2V3V4	**a:b:c:d**	a:b:c:d	**1V2V3V4**
4.48	**1**			1H2V3H4	**a.b:c.d**	(A.B):(c.D)	**(11H22)V(3H44)**
4.49	**1**			1V2H3H4	**a:b.c.d**	(A):(b.C.D)	**(11)V(2H33H44)**
4.50	**1**			1H2V3H4	**a.b:c.d**	a:(b:(C.d))	**1V(2V(33H4))**
4.51	**1**			1V2H3V4	**a:b.c:d**	(A:b).(C.D)	**(11V2)H(33H44)**
4.52	**2**			1H2V3H4	**a.b:c.d**	(a:B).(C.d)	**(1V22)H(33H4)**
4.53	**1**			1V2V3H4	**a:b:c.d**	(a):((B:c).(d))	**(1)V))22V3)H(4))**
4.54	**1**			1H2V3V4	**a.b:c:d**	(a.B):(C:D)	**(1H22)V(33V44)**
4.55	**1**			1H2V3V4	**a.b:c:d**	(A.b):(C:d)	**(11H2)V(33V4)**
4.56	**1**			1H2V3H4	**a.b:c.d**	(a.B):(c:D)	**(1H22)V(3V44)**

A. CLASS	B. RANKING	C. QUADRAT DIAGRAM	D. EXAMPLE FROM CODICES	E. NUMERIC GENERAL DESCR.	F. LETTER GENERALDESCR	G. LETTER SPECIFIC DESCR.	H. NUMERIC SPECIFIC DESCR.
Class	SQL_...	Quadrat_type...	Quadrat_exa...	Joiner_repre...	Joiner_st...	Joiner_repr...	Joiner_str_calc_p...
4.57	1			1V2V3H4	a:b:c.d	(A:b:c).(d)	(11V2V3)H(4)
4.58	1			1V2H3V4	a:b.c:d	(a):((b).(c:D))	(1)V))2)H(3V44))
4.59	1			1H2H3V4	a.b.c:d	a.((B.C):d)	1H))22H33)V4)
4.60	1			1H2V3V4	a.b:c:d	A.(B:c:d)	11H(22V3V4)
5.01	2			1V2H3H4V5	a:b.c.d:e	(a:B).c.(D:e)	(1V22)H3H(44V5)
5.02	0			1V2H3V4V5	a:b.c:d:e		
5.03	1			1V2H3V4V5	a:b.c:d:e	(A:B).(c:D:e)	(11V22)H(3V44V5)
5.04	5			1H2V3H4V5	a.b:c.d:e	A.(B:c).(D:e)	11H(22V3)H(44V5)
5.05	1			1H2H3V4H5	a.b.c:d.e	A.(b.C):(d:E)	11H(2H33)V(4V55)
5.06	0			1H2V3H4V5	a.b:c.d:e	a.(b:C).(D:e)	1H(2V33)H(44V5)
5.07	1			1V2V3H4V5	a:b:c.d:e	(a:B:c).(d:E)	(1V22V3)H(4V55)
5.08	1			1V2H3H4V5	a:b.c.d:e	(A:b).c.(D:e)	(11V2)H3H(44V5)
5.09	1			1H2V3H4V5	a.b:c.d:e	a.(B:C).((d:E))	1H(22V33)H))4V55))
5.10	2			1V2V3H4V5	a:b:c.d:e	(a:B:C).((D:e))	(1V22V33)H))44V5))
5.11	2			1V2H3V4V5	a:b.c:d:e	(a:B).(c:d:E)	(1V22)H(3V4V55)
5.12	3			1H2V3H4V5	a.b:c.d:e	a.(B:c).(D.e)	1H(22V3)H(44H5)
5.13	2			1V2V3H4V5	a:b:c.d:e	(a:b:C).(D:E)	(1V2V33)H(44V55)
5.14	1			1V2V3H4V5	a:b:c.d:e	(a:b:C).(d:E)	(1V2V33)H(4V55)
5.15	1			1V2L3H4V5	a:b[c.d:e	a.(B»C).(d:E)	1H(22I33)H(4V55)
5.16	2			1H2V3H4V5	a.b:c.d:e	a.(B:C).(D:E)	1H(22V33)H(44V55)

A. CLASS	B. RANKING	C. QUADRAT DIAGRAM	D. EXAMPLE FROM CODICES	E. NUMERIC GENERAL DESCR.	F. LETTER GENERALDESCR	G. LETTER SPECIFIC DESCR.	H. NUMERIC SPECIFIC DESCR.
Class	**SQL_...**	**Quadrat_type...**	**Quadrat_exa...**	**Joiner_repre...**	**Joiner_st...**	**Joiner_repr...**	**Joiner_str_calc_p...**
5.17	**1**			1V2V3H4V5	**a:b:c.d:e**	(a):((B:c).(D:e))	**(1)V))22V3)H(44V5))**
6.01	**2**			1V2V3H4V5V6	**a:b:c.d:e:f**	(a:b:c).(d:e:f)	**(1V2V3)H(4V5V6)**