THE INDUS SCRIPT: TEXT AND CONTEXT
A STATISTICAL-POSITIONAL ANALYSIS OF SIGNIFICANT TEXT SEGMENTS

(Sundar Ganesan, Chandrasekhar Subramanian, G.C. Suresh Babu, and Iravatham Mahadevan)*

1. Scope of the paper

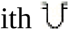
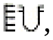
While the total number of signs and sign combinations in the Indus texts are large, the texts can be segmented into much smaller numbers of signs, sign pairs and sign triplets (The segmentation procedures are well-known and are not included in this paper)[1]. If these significant segments are analysed textually and contextually, one can extract the core of information recorded in the texts (Statements 1.1 to 3.4 attached). Such a study will not only save much time and labour, but also hopefully show the way to further progress in understanding the Indus texts. The analysis makes no assumptions about the language of the texts or the sounds or meanings of the signs.

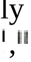
2. Source:

The attached statements are derived from the computer database (henceforth M77) compiled at the TIFR by Iravatham Mahadevan et al (1977 - 80) and the pictorial version in the book '*The Indus Script: Texts, Concordance and Tables*' (Mahadevan 1977).

3. Significant Text Segments:

3.1 Signs: There are 417 signs with a total of 13372 occurrences in M77. However, only 153 signs occurring 10 times or more account for as much as 94.24 percent of the total sign occurrences.

3.2 Sign pairs: There are 2758 sign pairs in M77, but only as few as 166 pairs occur 10 times or more (excluding those commencing with signs , or , or with  or (these two with some exceptions such as , ,), or with which do not occur initially in significant pairs).

3.3 Sign triplets: There are 3710 triplets in M77; but only as few as 68 triplets occur 10 times or more (excluding those commencing with signs ,, ; and ; and which do not occur initially in significant triplets).

The exclusions and exceptions are based on segmentation analysis (not included in this paper). Thus 153 signs, 166 sign pairs and 68 sign triplets have been identified as significant text segments for further analysis.

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* Indus Research Centre, Roja Muthiah Research Library, Chennai

[1] Mahadevan(1978), Nisha Yadav, et al. (2008)

4. Textual Analysis:

The selected signs, pairs and triplets are listed in the order of total frequencies as well as in the order of positional frequencies (solus, initial, medial and final).

The preliminary analysis shows that the significant text segments can be classified broadly into only two categories, viz., one including solus and initial occurrences, and the other of final occurrences. The medial occurrences may belong to either category depending on whether they are quasi-initial (that is, word-initial segments occurring in the middle) or quasi-final (that is, word-final segments occurring in the middle). (Signs may occur in solus / initial and final positions with respect to a line of text, but not generally with respect to the whole text. Exceptions to this pattern require further study and may include errors in coding.)

5. Context Analysis:

5.1 Parameters: The following three parameters have been chosen for context analysis:

(1) Sites: Inscribed objects from 19 Harappan and 5 West Asian sites have been included in M77. However, only four sites, viz, Mohenjodaro (MD), Harappa (HP) Lothal (LL) and Kalibangan (KB) (yielding a minimum of 100 inscribed objects each) account for 2789 out of 2906 objects (95.97%).

(2) Object types: 2906 inscribed objects classified into 9 types have been included in M77. However, only 5 types, namely seals, sealings, miniature tablets, copper tablets and pottery graffiti each with a minimum of 100 occurrences, account for as much as 98.11% of the total.

(3) Field symbols: 99 field symbols (that is, pictorial or iconographic motifs occupying the field as distinguished from signs of the Indus script) are listed in M77. However only 17 field symbols with a minimum of 10 occurrences each account for 84.97 % of the total. The field symbols 35 (uncertain animal) 97 (geometrical patterns), 98 (ornamental borders) and 99 (damaged or illegible) are not considered.

5.2 Analytical Statements (Attached):

The significant text segments (signs, pairs and triplets) are analysed with respect to the selected parameters (site, object type and field symbol) in the attached statements.

5.3 Locus and Stratigraphy – not included:

Another important parameter, namely the locus and stratigraphy of inscribed objects, could not be included in this analysis. Statistics on locus and stratigraphy available in respect of MD, HP and CH are included in the computer data base (M77) but not published in Mahadevan 1977. However,

> due to the pre-modern techniques of excavation, true stratigraphy has not been scientifically recorded for these sites (Mythili Rangarao and Iravatham Mahadevan 1987). When the original Field Notes are fully published, such context analysis may become possible.

6. Some Preliminary Results

6.1 Frequency-Distribution Analysis of frequent signs by sites (Statement 1.2):

The total sign occurrences in M77 (13372) are distributed in the major sites as follows:

Site	Sign occurrences	Percent
MD	7281	54.45
HP	4359	32.60
LL	760	5.68
KB	423	3.16
Total	**12823**	**95.89**

The enclosed statement (Statement 1.2) highlights cases of significant deviations from the expected normal frequency of sign occurrences. Some examples are given below.

Sign	MD	HP
	101	239
	28	288
	120	175
	68	84

The observed deviations from normal distribution prompt us to seek explanations. In these particular cases, the deviations may be due to sites. However, that this is not the sole cause can be seen from the following analysis of sign occurrences with respect to object types (Statement 1.3)

6.2 Frequency-Distribution Analysis of frequent signs by object types
(Statement 1.3):

The total sign occurrences in M77 (13372) are distributed among the major object types as follows:

Object types	Sign Occurrences	Percent
Seals	8312	62.16
Sealings	2582	19.31
Miniature Tablets	1261	9.43
Copper Tablets	718	5.37
Pottery Graffiti	281	2.10
Total	**13154**	**98.37**

6.2.1 Miniature Tablets: Sign (7th in the order of total frequency) overtakes even the most frequent sign and is ranked first on miniature tablets. Similarly the sign which shows abnormal deviation with respect to sites (more in HP than in MD) and also has equally abnormal deviation with respect to object types, preferring miniature tablets to seals. Thus it appears that the main cause of deviation in these cases is the object type and not the site. However, miniature tablets do not at all occur in MD probably because the lowest levels could not be reached due to the much higher water table in modern times.

6.2.2 Copper Tablets: The copper tablets occur only at MD and at no other site. In this case, there is clear correlation between object type and site. One may say that copper tablet - using people lived only at Mohenjodaro (in the Late Period as known from stratigraphic evidence).

Another important feature relating to copper tablets is that some frequent signs do not occur on them with expected frequencies. Examples:

(1) The following frequent signs do not occur at all on copper tablets:
, , , , , , and .

(2) On the other hand, the following signs occur relatively much more often on copper tablets:
, , , , and .

An important result is that some similar-looking signs are not really sign-variants but separate and independent signs as revealed by the evidence of copper tablets. For example:

and ; and ; and ; and ; and .

6.3 Frequency-Distribution Analysis of frequent signs by Field Symbols
(Statement 1.4):

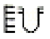
All selected signs occur at least once with FS 01 (Unicorn).
The FS 16 (Hare) occurs only with signs , , , , and .
The sign and , and occur most frequently with FS 83 (Dot in circle).
Sign occurs most frequently with FS 14 (Ox-Antelope)

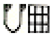
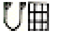
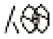
7. Analysis of Sign Pairs and Triplets

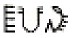
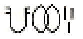
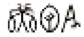
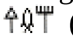
Similar analysis with respect to the other significant text segments (pairs and triplets) has been carried out with respect to the selected parameters (Statements 2.1, 2.2, 2.3, 2.4, 3.1, 3.2, 3.3, 3.4).

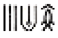
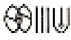
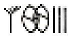
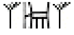
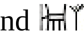
7.1 Textual and Contextual Analysis of Pairs and Triplets

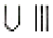
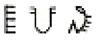
(1) Of the 166 pairs selected 33 start with Number signs (19.5%) and 25 start with a fish sign (14.8%). Similarly 38 of the 166 pairs end with a Jar sign (22.5%) and 16 end with fish signs (9.5%)

(2) The sign pair occurs mostly in the initial position with a frequency of 254 out of 291, mostly on seals and sealings but does not occur on copper tablets, while  occurs mostly in the final position with a frequency of 179 out of 184, occurs mostly on miniature tablets and sealings and does not occur on copper tablets. The greater affinity for the former pair is towards MD along with the field symbol Unicorn while for the latter it is Harappa along with the field symbol Gharial / Dot in circle.

(3) The following pairs occur neither in initial nor final positions: , , , .  occurs mostly in MD along with FS 14 (Ox-Antelope) and mostly on copper tablets and one occurrence on sealings; in HP along with FS 01 (Unicorn) and only on sealings and seals;  only in MD along with FS 14 (Ox-Antelope) only on copper tablets; mostly in MD along with FS 01 (Unicorn) mostly on copper tablets and seals.

(4) The following triplets occur more frequently as solus and therefore may represent a complete phrase:  (f=41) occurs mostly in Harappa along with FS 83 (Dot in circle) mostly on miniature tablets and never on copper tablets or pottery,  (f=14) (FS 01 (Unicorn), 07 (Elephant) and 91 (Shape of Double shield or Double-axe)) mostly in HP and mostly on miniature tablets,  (f=12) occur mostly in HP along with FS 44 (Kino tree) and FS 01 (Unicorn) mostly on seals and sealings,  (f=11) occur mostly in MD and HP along with FS 01 (Unicorn) and FS 83 (Dot in circle) mostly on seals and miniature tablets.

(5) The FS 16 (Hare) occurs only with the following triplets: , , ,  and .

(6) The pair  and the triplet  show much greater affinity to Harappa (site), Miniature tablets (type) and Dot in circle (field symbol).

(7) The significant text segments do not appear to have special affinity to field symbols with which they are associated on seals and sealings. This is also shown by the simple observation that the same text occurs with different field symbols and vice versa. However, one notable exception is the association of significant text segments with particular field symbols on the copper tablets, (e.g. texts with the field symbol 'hare facing a bush').

8. Preliminary Conclusions

This exercise is confined to the statistical analysis of position and frequency of the textual segments and their special affinity to the background such as site, object type and field symbol.

The authors wish to emphasize that the choice of frequent segments and frequent parameters would enable us to extract the core of available information of the Indus Script with minimum effort. This is a preliminary exercise and the authors' expectation is that this study will show the way for reaching other areas not covered in this study.

One of the goals of the authors is to ascertain the language of the Indus Script through a study of its textual segments; the authors have in mind the work of Emil Forrer (1932) who studied the Hittite hieroglyphic scripts through such methods even before sufficiently deciphering the script.

9. Acknowledgement

The authors wish to thank Suvidha Nair for helping with the analysis of the data.

Enclosure: List of attached statements

List of attached statements:

1.1 - Frequency Distribution of Frequent Signs: Within a Line of Text
1.2 - Frequency Distribution of Frequent Signs by Major Sites
1.3 - Frequency Distribution of Frequent Signs by Object Types
1.4 - Frequency Distribution of Frequent Signs by Field Symbol
2.1 - Positional Distribution of Selected Pairs: Within a Line of Text
2.2 - Frequency Distribution of Frequent Pairs by Major Sites
2.3 - Frequency Distribution of Frequent Pairs by Object Types
2.4 - Frequency Distribution of Frequent Pairs by Field Symbol
3.1 - Positional Distribution of Selected Triplets: Within a Line of Text
3.2 - Frequency Distribution of Frequent Triplets by Major Sites
3.3 - Frequency Distribution of Frequent Triplets by Object Types
3.4 - Frequency Distribution of Frequent Triplets by Field Symbol

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Mythili Rangarao and Iravatham Mahadevan

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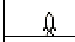
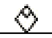
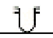
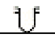
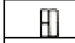
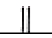
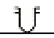
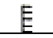
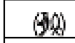
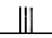
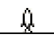
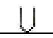
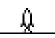
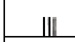
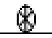
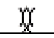
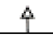
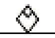
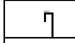
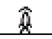
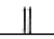
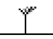
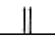
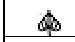
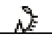
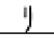
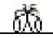
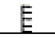
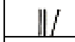
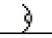
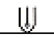
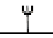
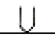
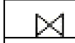
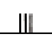
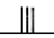
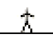
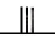
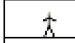
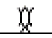
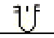
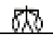
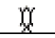
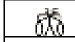
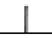
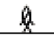
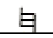
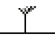
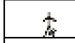
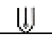
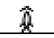
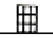
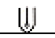
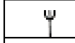
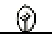
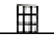
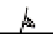
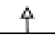
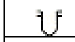
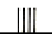
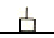
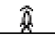
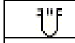
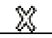
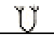
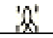
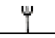
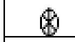
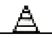
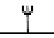
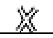
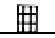
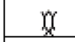
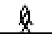
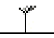
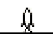
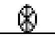
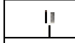
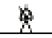
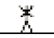
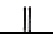
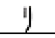
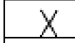
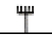
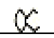
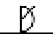
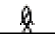
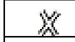
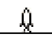
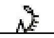
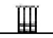
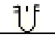
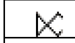
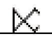
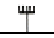
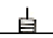
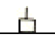
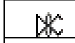
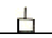
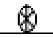
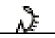
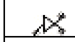
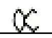
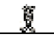
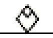
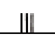
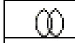
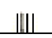
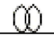
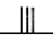
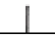
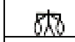
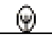
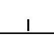
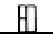
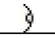
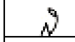
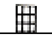
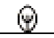
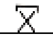
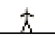
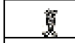
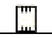
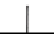
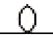
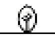
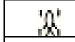
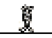
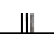
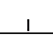
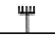
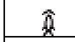
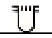
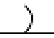
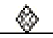
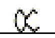
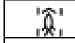
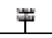
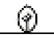
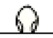
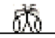
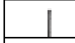
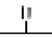
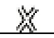
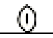
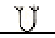
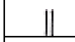
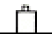
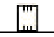
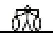
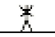
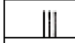
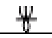
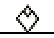
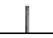
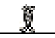
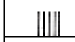
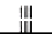
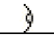
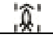
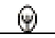
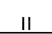
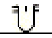
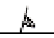
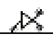
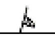
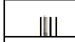
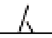
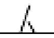
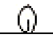
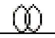
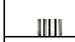
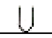
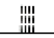
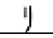
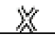
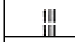
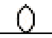
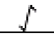
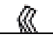
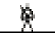
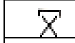
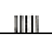
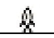
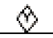
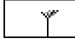
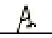
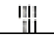
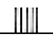
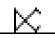
2008. Segmentation of Indus Texts. Nisha Yadav, M. N. Vahia, Iravatham Mahadevan and H. Joglekar. *International Journal of Dravidian Linguistics*, 37(1) : 53-72.

Statement 1.1: Frequency Distribution of Frequent Signs Within a Line of Text (Minimum total sign frequency =10)

Solus		Initial		Medial		Final		Total	
Sign	Freq	Sign	Freq	Sign	Freq	Sign	Freq	Sign	Freq
	18		298		625		971		1,395
	9		147		420		316		649
	8		140		309		274		381
	7		135		209		184		376
	7		77		199		130		365
	7		74		186		92		355
	5		72		168		90		323
	4		71		159		86		314
	3		68		152		69		279
	3		67		148		61		240
	3		65		137		43		236
	3		65		136		30		227
	3		59		128		22		216
	3		51		116		21		212
	3		50		109		20		207
	2		40		106		18		195
	2		38		103		18		193
	2		37		96		17		188
	2		36		93		16		177
	2		36		92		16		170
	2		35		87		16		168
	2		32		75		15		151
	2		31		74		14		149
	1		30		72		14		136
	1		28		72		13		134
	1		26		70		13		134
	1		25		70		12		132
	1		25		69		12		130
	1		24		69		12		126
	1		22		65		12		118
	1		22		63		11		105
	1		21		62		11		105
	1		20		61		10		102
	1		20		61		9		99
	1		19		59		9		93
	1		19		58		7		92
	1		19		58		7		91
	1		18		55		7		91
	1		18		54		6		90

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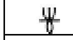
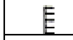
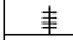
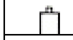
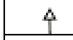
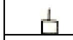
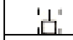
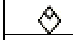
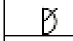
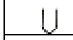
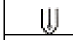
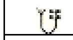
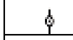
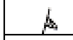
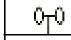
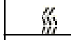
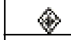
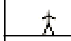
	1		18		53		6		89
	1		18		49		6		88
	1		17		49		5		88
	1		17		49		5		80
	1		17		47		5		78
	1		17		45		5		76
	1		16		45		5		73
	1		16		44		5		73
	1		16		42		5		70
	1		15		41		5		70
	1		15		38		4		70
	1		15		38		4		69
	1		14		36		4		64
	1		14		36		4		63
	1		14		35		4		63
			13		35		4		61
			13		33		4		60
			12		33		4		59
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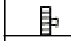
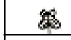
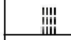
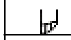
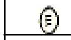
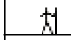
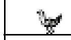
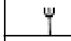
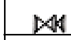
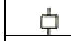
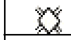
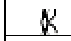
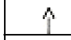
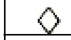
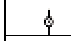
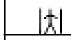
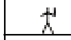
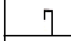
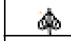
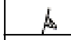
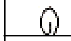
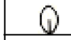
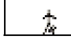
			12		32		3		57
			12		31		3		54
			11		31		3		54
			11		31		3		53
			11		30		3		53
			10		29		3		51
			10		29		3		51
			10		29		3		50
			10		28		2		50
			10		27		2		49
			10		26		2		48
			9		25		2		44
			9		25		2		43
			9		24		2		42
			9		23		2		41
			7		23		2		38
			7		22		2		38
			7		20		2		38
			7		20		2		35
			7		20		2		35
			6		20		1		35
			6		19		1		35
			5		19		1		35

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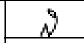
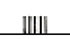
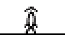
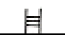
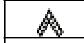
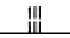
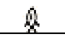
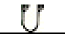
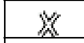
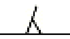
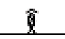
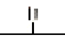
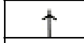
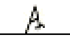
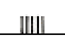
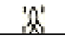
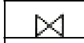
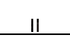
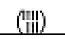
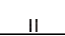
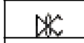
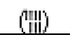
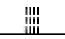
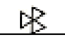
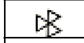
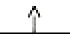
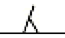
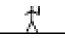
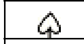
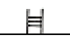
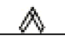
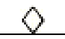
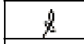
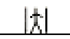
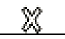
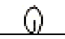
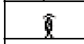
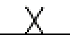
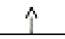
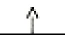
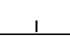
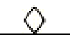
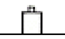
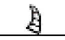
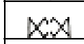
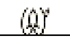
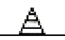
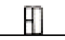
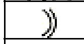
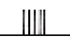
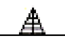
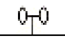
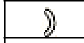
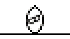
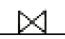
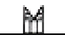
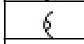
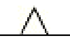
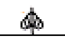
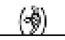
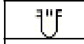
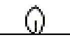
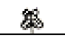
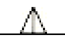
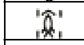
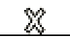
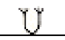
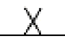
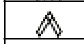
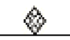
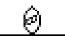
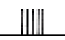
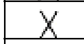
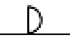
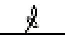
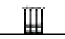
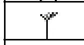
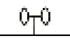
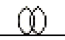
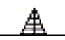
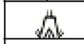
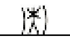
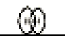
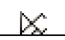
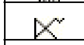
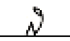
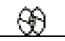
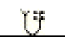
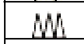
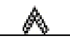
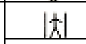
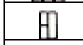
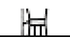
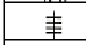
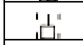
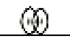
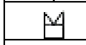
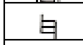
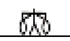
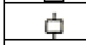
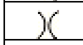
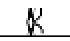
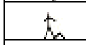
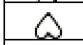
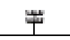
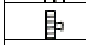
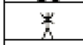
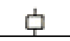
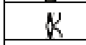
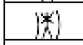
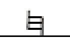
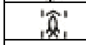
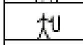
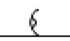
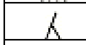
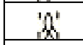
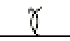
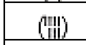
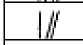
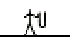
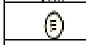
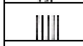
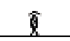
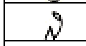
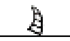
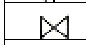
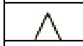
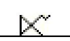
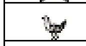
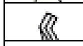
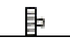
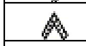
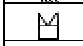
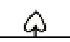
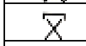
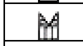
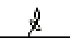
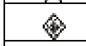
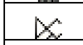
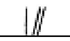
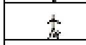
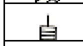
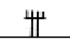
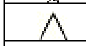
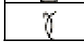
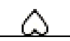
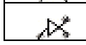
			5		18		1		33
			5		17		1		32
			5		17		1		30
			5		17		1		29
			5		16		1		29
			5		16		1		29
			5		16		1		27
			5		15		1		27
			5		14		1		27
			4		14		1		26
			4		14		1		26
			4		13		1		26
			4		13		1		26
			4		13		1		25
			4		12		1		24
			4		12		1		24
			3		11		1		23
			3		11		1		22
			3		11		1		22
			3		11		1		22
			3		10		1		22
			3		10		1		22
			3		10				21
			3		10				21
			3		10				21
			3		9				21
			3		9				20
			3		9				20
			3		9				19
			2		9				19
			2		9				18
			2		9				17
			2		8				17
			2		8				16
			2		8				16
			2		8				15
			2		8				15
			2		8				15
			2		8				15
			2		7				14
			2		7				14
			2		7				14

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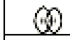
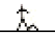
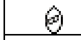
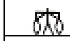
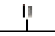
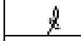
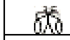
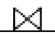
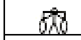
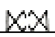
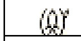
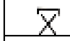
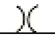
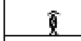
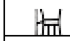
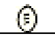
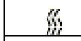
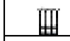
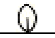
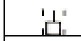
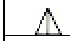
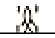
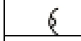
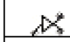
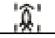
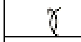
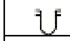
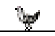
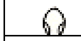
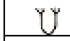
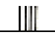
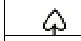
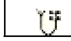
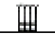
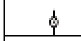
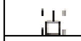
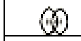
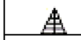
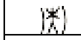
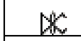
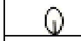
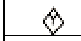
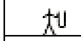
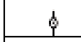
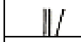
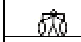
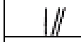
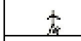
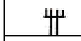
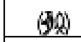
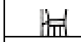
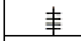
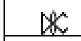
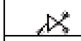
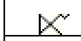
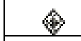
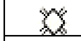
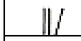
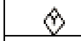
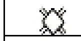
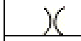
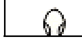
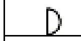
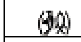
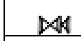
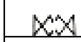
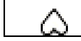
			2		6				14
			1		6				14
			1		6				13
			1		6				13
			1		6				13
			1		6				13
			1		6				13
			1		5				13
			1		5				13
			1		5				13
			1		5				13
			1		5				13
					5				13
					4				12
					4				12
					4				11
					3				11
					2				11
					2				11
					2				11
					2				11
					2				11
					2				11
					1				11
					1				11
					1				11
									10
									10
									10
									10

Statement 1.2: Frequency Distribution of Frequent Signs by Major Sites (min. 100 inscriptions)

(minimum sign frequency =10)

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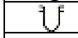
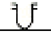
	766		472		73		44
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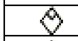
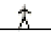
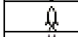
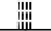
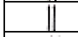
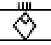
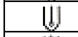
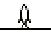
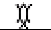
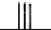
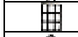
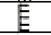
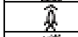
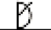
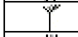
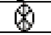
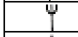
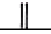
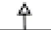
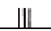
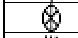
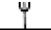
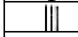
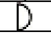
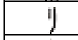
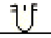
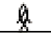
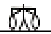
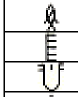
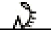
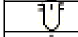
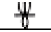
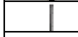
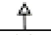
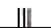
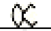
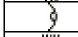
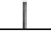
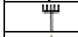
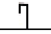
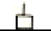
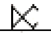
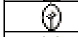
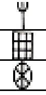
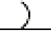
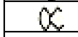
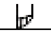
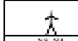
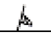
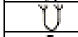
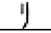
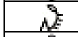
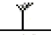
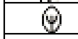
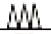
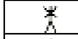
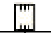
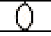
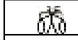
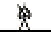
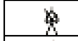
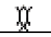
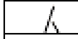
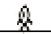
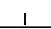
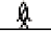
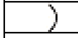
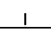
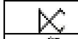
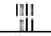
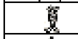
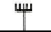
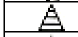
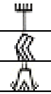
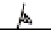
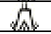
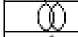
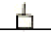
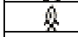
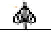
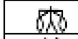
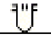
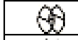
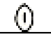
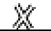
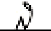
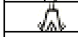
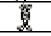
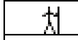
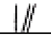
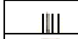
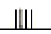
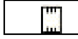
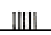
	216		239		35		21
	205		175		25		16
	165		162		20		14
	156		137		20		12
	147		122		17		9
	144		103		17		9
	135		90		16		8
	134		84		15		8
	133		79		15		7
	130		74		15		7
	130		69		15		7
	120		58		14		7
	120		57		14		7
	109		57		14		6
	101		54		13		6
	101		54		12		6
	91		52		11		6
	84		51		11		5
	79		45		11		5
	78		44		11		5
	78		43		11		5
	77		43		10		5
	74		43		10		5
	70		41		8		5
	69		41		8		4
	68		40		7		4
	68		39		7		4
	67		37		7		4
	67		37		7		4
	62		36		7		3
	60		36		6		3
	58		35		5		3
	56		35		5		3
	55		35		5		3
	54		28		5		3
	52		28		5		3
	51		24		5		3
	51		22		4		3
	46		22		4		3
	44		22		4		3
	43		22		4		3
	42		21		4		3
	41		21		4		2
	41		20		4		2
	40		20		4		2
	40		20		3		2
	40		20		3		2

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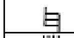
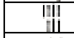
	40		19		3		2
	39		19		3		2
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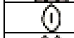
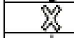
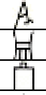
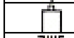
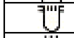
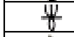
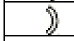
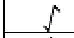
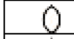
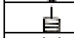
	35		18		3		2
	34		18		3		2
	34		18		3		2
	34		18		3		2
	33		18		3		2
	32		18		3		1
	32		18		3		1
	31		18		3		1
	31		17		3		1
	30		17		3		1
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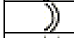
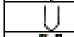
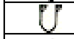
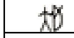
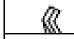
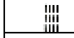
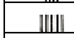
	28		16		3		1
	28		16		2		1
	28		15		2		1
	27		15		2		1
	27		14		2		1
	26		14		2		1
	25		14		2		1
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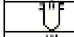	24		12		2		1
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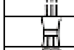
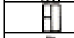
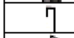
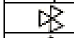
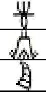
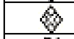
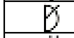
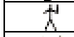
	22		11		2		1
	22		11		2		1
	21		11		2		1
	21		11		2		1
	21		11		2		1
	21		11		2		1
	20		10		2		1
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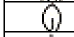
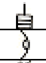
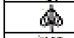
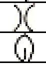
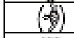
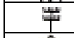
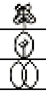
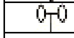
	20		9		1		1
	20		9		1		1
	18		9		1		1
	17		9		1		1
	17		9		1		1
	17		8		1		1
	17		8		1		1
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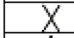
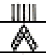
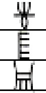
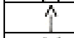
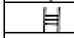
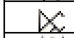
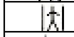
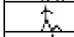
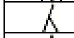
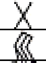
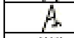
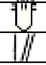
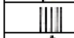
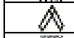
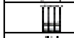
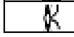
	16		8		1		
	16		8		1		
	16		8		1		
	16		7		1		
	15		7		1		
	15		7		1		
	15		7		1		
	15		7		1		
	14		6		1		
	14		6		1		
	14		6		1		
	13		6		1		

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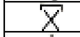
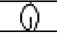
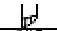
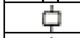
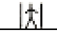
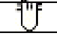
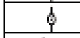
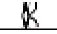
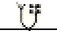
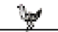
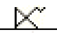
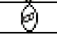
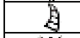
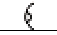
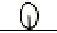
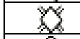
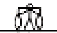
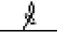
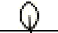
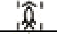
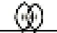
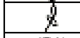
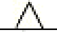
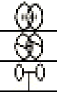
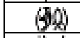
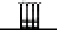
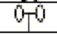
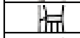
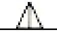
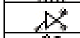
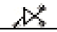
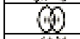
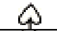
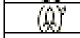
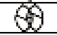
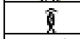
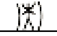
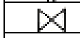
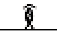
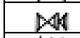
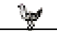
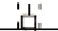
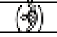
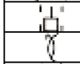
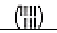
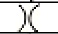
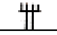
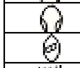
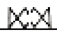
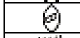
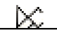
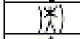
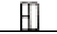
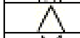
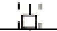
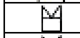
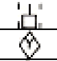
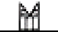
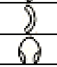
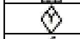
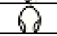
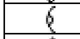
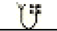
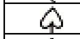
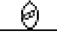
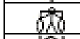
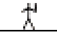
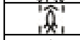
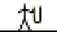
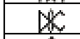
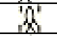
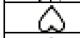
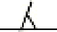
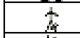
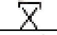
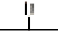
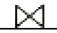
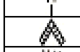
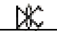
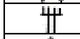
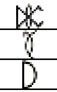
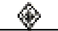
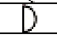
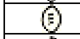
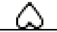
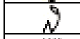
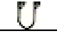
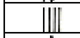
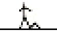
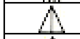
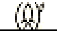
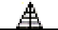
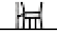
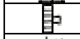
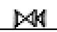
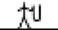
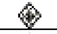
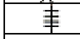
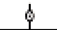
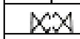
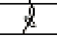
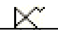
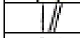
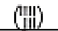
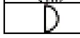
	12		6		1		
	12		5		1		
	12		5		1		
	11		5		1		
	11		5		1		
	11		4		1		
	11		4		1		
	11		4		1		
	10		4		1		
	10		4				
	10		4				
	10		4				
	9		4				
	9		3				
	9		3				
	9		3				
	9		3				
	9		3				
	9		3				
	9		3				
	9		3				
	8		3				
	8		3				
	8		3				
	8		3				
	8		3				
	8		3				
	8		3				
	7		2				
	7		2				
	7		2				
	7		2				
	6		2				
	6		2				
	6		2				
	6		2				
	6		2				
	6		2				
	5		2				
	5		1				
	5		1				
	5		1				
	5		1				
	4		1				
	4		1				
	4		1				
	4						
	3						
	3						
	1						

Statement 1.3: Frequency Distribution of Frequent Signs by Object Types (min. 100 inscriptions)

(minimum total sign frequency =10)

Seals		Sealings		Min. Tab		Cop. Tab		Pot. Graf	
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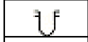
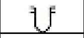
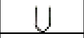
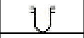
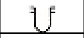
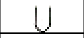
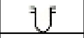
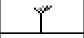
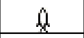
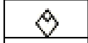
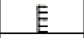
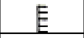
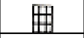
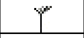
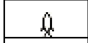
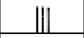
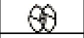
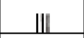
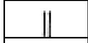
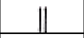
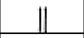
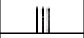
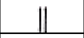
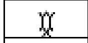
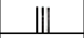
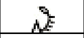
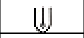
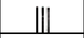
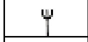
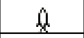
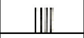
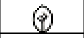
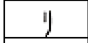
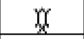
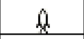
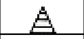
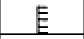
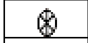
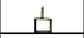
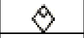
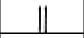
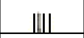
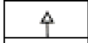
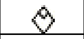
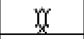
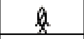
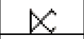
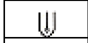
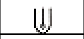
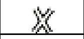
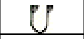
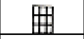
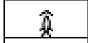
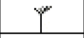
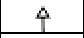
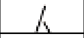
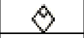
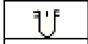
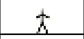
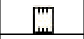
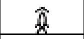
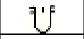
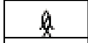
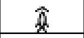
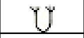
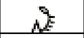
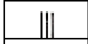
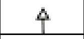
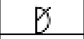
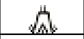
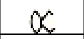
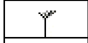
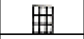
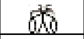
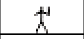
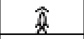
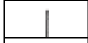
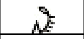
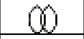
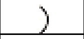
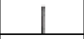
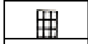
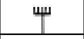
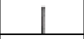
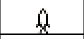
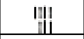
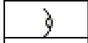
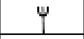
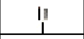
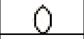
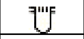
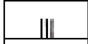
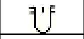
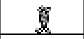
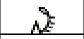
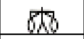
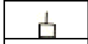
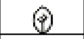
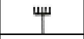
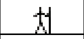
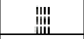
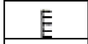
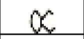
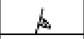
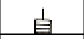
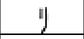
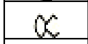
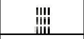
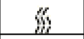
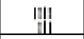
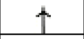
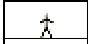
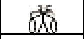
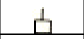
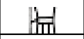
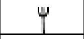
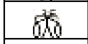
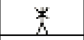
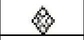
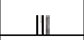
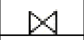
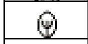
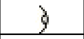
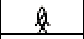
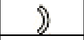
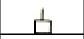
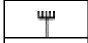
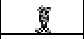
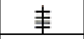
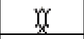
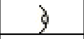
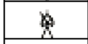
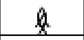
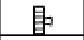
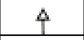
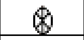
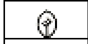
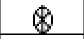
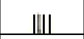
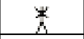
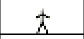
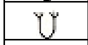
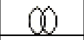
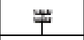
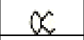
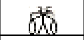
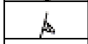
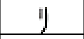
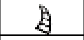
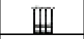
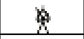
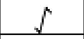
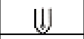
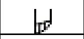
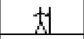
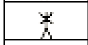
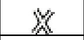
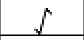
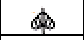
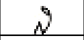
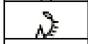
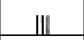
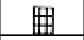
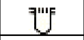
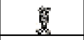
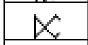
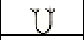
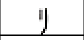
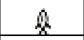
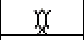
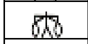
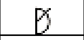
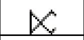
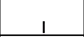
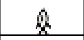
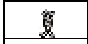
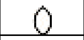
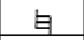
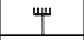
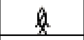
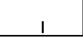
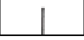
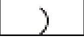
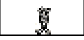
	835		273		160		82		34
	515		140		152		60		14
	288		121		127		48		13
	244		115		80		34		12
	188		76		68		29		9
	168		75		48		27		6
	163		72		48		25		6
	162		72		34		22		6
	162		57		24		21		5
	155		50		23		20		5
	151		50		19		20		5
	148		47		19		17		5
	134		42		18		16		5
	133		42		17		16		4
	124		42		16		16		4
	115		38		15		15		4
	111		34		15		15		4
	109		34		14		14		4
	103		33		13		14		4
	102		33		12		13		3
	97		32		12		12		3
	89		31		12		11		3
	86		29		11		10		3
	84		27		11		10		3
	80		26		11		9		3
	80		26		9		9		3
	79		25		9		8		3
	76		24		9		8		3
	75		23		8		7		2
	74		22		8		7		2
	73		21		8		7		2
	71		21		8		7		2
	69		21		7		6		2
	67		20		7		6		2
	64		20		6		5		2
	62		19		6		5		2
	62		19		6		5		2
	62		18		6		4		2

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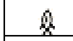
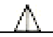
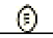
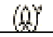
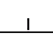
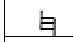
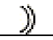
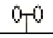
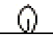
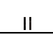
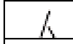
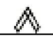
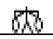
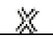
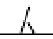
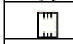
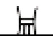
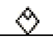
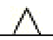
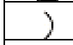
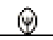
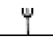
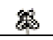
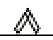
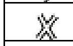
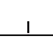
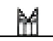
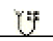
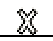
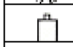
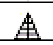
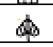
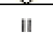
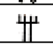
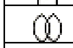
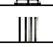
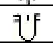
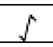
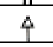
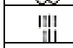
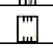
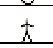
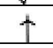
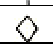
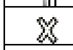
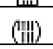
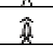
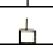
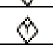
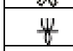
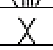
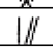
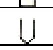
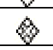
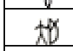
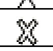
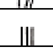
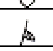
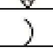
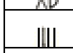
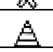
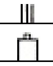
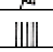
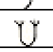
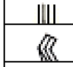
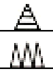
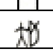
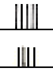
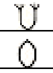
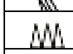
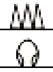
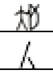
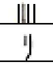
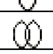
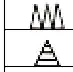
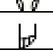
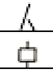
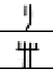
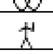
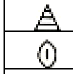
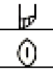
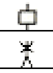
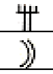
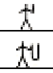
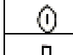
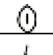
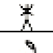
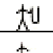
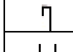
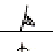
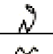
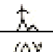
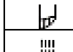
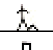
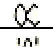
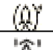
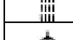
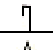
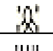
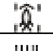
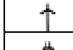
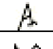
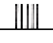
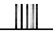
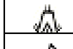
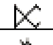
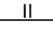
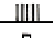
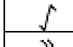
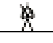
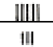
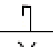
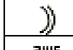
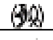
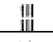
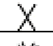
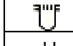
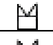
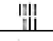
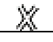
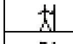
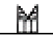
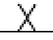
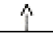
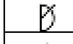
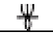
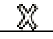
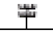
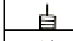
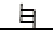
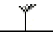
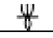
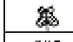
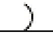
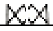
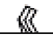
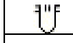
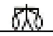
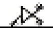
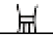
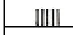
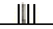
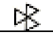
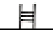
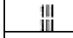
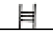
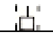
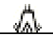
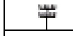
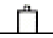
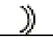
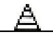
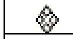
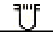
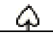
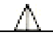
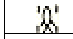
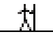
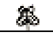
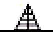
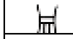
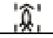
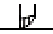
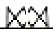
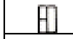
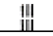
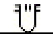
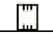
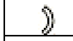
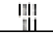
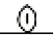
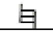
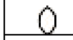
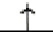
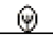
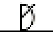
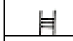
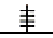
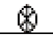
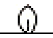
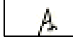
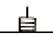
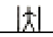
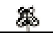
	59		17		6		4		2
	56		17		6		4		2
	54		16		5		3		2
	54		16		5		3		2
	51		16		5		3		2
	48		15		5		3		2
	48		15		5		2		2
	48		13		5		2		2
	47		13		4		2		2
	47		12		4		2		2
	43		12		4		2		2
	42		12		4		2		2
	42		12		4		1		2
	42		12		3		1		2
	42		12		3		1		2
	41		12		3		1		1
	41		12		2		1		1
	38		12		2				1
	38		11		2				1
	36		11		2				1
	36		11		2				1
	34		11		2				1
	33		10		2				1
	33		10		2				1
	33		10		2				1
	32		10		2				1
	31		9		2				1
	30		9		2				1
	30		9		2				1
	28		8		2				1
	27		8		2				1
	27		8		2				1
	26		8		2				1
	26		8		2				1
	25		7		2				1
	25		7		2				1
	25		7		2				1
	25		7		2				1
	25		7		2				1
	25		7		2				1
	24		7		2				1
	22		7		1				1

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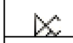
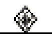
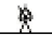
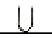
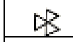
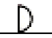
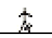
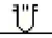
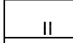
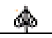
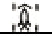
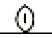
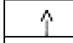
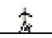
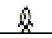
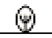
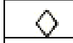
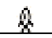
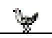
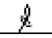
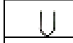
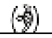
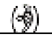
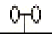
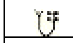
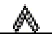
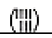
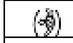
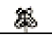
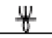
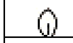
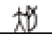
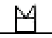
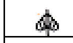
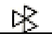
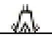
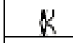
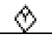
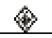
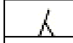
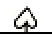
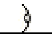
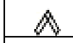
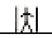
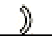
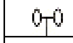
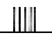
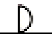
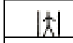
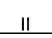
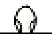
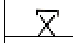
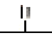
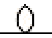
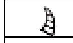
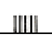
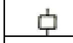
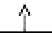
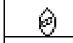
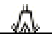
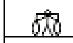
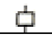
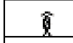
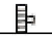
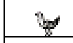
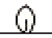
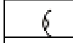
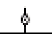
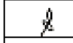
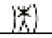
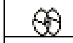
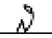
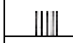
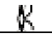
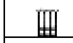
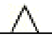
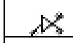
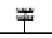
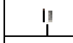
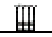
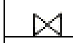
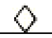
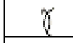
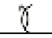
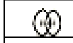
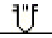
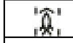
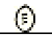
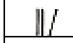
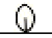
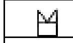
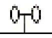
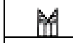
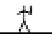
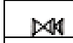
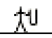
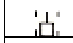
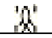
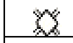
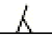
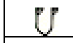
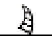
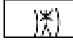
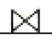
	22		7		1				1
	22		7		1				1
	21		7		1				1
	21		6		1				1
	20		6		1				1
	19		6		1				1
	19		6		1				
	17		6		1				
	17		5		1				
	17		5		1				
	16		5		1				
	16		5		1				
	16		4		1				
	16		4		1				
	15		4		1				
	15		4		1				
	15		4						
	14		4						
	14		4						
	13		4						
	13		4						
	13		4						
	13		4						
	13		3						
	13		3						
	12		3						
	12		3						
	12		3						
	11		3						
	11		3						
	11		3						
	11		3						
	10		3						
	10		3						
	10		3						
	10		2						
	10		2						
	10		2						
	10		2						
	10		2						
	9		2						

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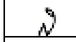
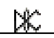
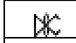
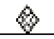
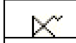
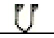
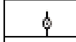
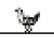
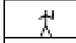
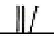
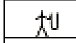
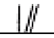
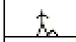
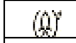
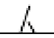
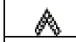
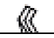
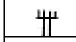
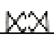
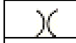
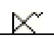
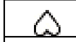
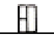
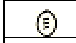
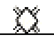
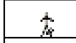
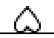
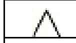
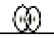
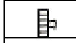
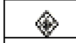
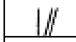
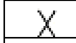
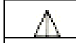
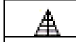
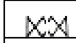
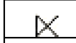
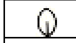
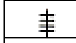
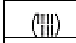
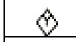
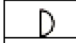
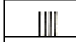
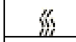
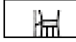
	9		2						
	9		2						
	9		2						
	9		1						
	8		1						
	8		1						
	8		1						
	8		1						
	8		1						
	8		1						
	8		1						
	8		1						
	8		1						
	7		1						
	7		1						
	7								
	7								
	6								
	6								
	6								
	6								
	6								
	6								
	6								
	5								
	4								
	4								
	3								
	2								
	2								
	1								

Statement 4.1: Frequency Distribution of Frequent Signs by Field Symbols (min. frequency of FS = 10)

(minimum total sign frequency = 10)

FS	Sign	Frq	Sign	Frq	Sign	Frq	Sign	Frq	Sign	Frq	Sign	Frq	Sign	Frq	Sign	Frq
01		550		385		212		169		135		129		119		119
		109		105		104		101		97		83		81		77
		75		71		67		66		65		65		59		59
		55		51		49		47		45		44		43		42
		41		37		37		36		36		35		34		34
		33		33		32		32		30		30		30		29
		29		29		28		27		27		26		26		25
		24		24		23		21		21		20		19		19
		18		18		18		17		17		16		16		16
		16		16		15		14		14		14		14		13
		13		13		13		12		12		12		11		11
		11		11		10		10		10		10		10		9
		9		9		9		9		9		9		8		8
		8		8		8		8		7		7		7		7
		7		7		7		7		7		7		7		7
		7		6		6		6		6		6		5		5
		5		5		5		5		5		4		4		3
		3		3		3		3		3		3		3		3
		3		2		2		2		1		1		1		
03		23		18		9		8		8		8		6		6
		5		5		5		4		4		4		4		3
		3		3		3		3		3		3		3		3
		2		2		2		2		2		2		2		2
		2		2		2		2		2		2		2		2
		2		2		2		2		1		1		1		1
		1		1		1		1		1		1		1		1
		1		1		1		1		1		1		1		1
		1		1		1		1		1		1		1		1
		1		1		1										
04		43		26		17		16		13		12		11		10
		10		10		9		9		9		8		8		8
		8		7		7		6		6		6		6		5
		5		5		5		5		5		4		4		4
		4		4		4		4		4		4		3		3
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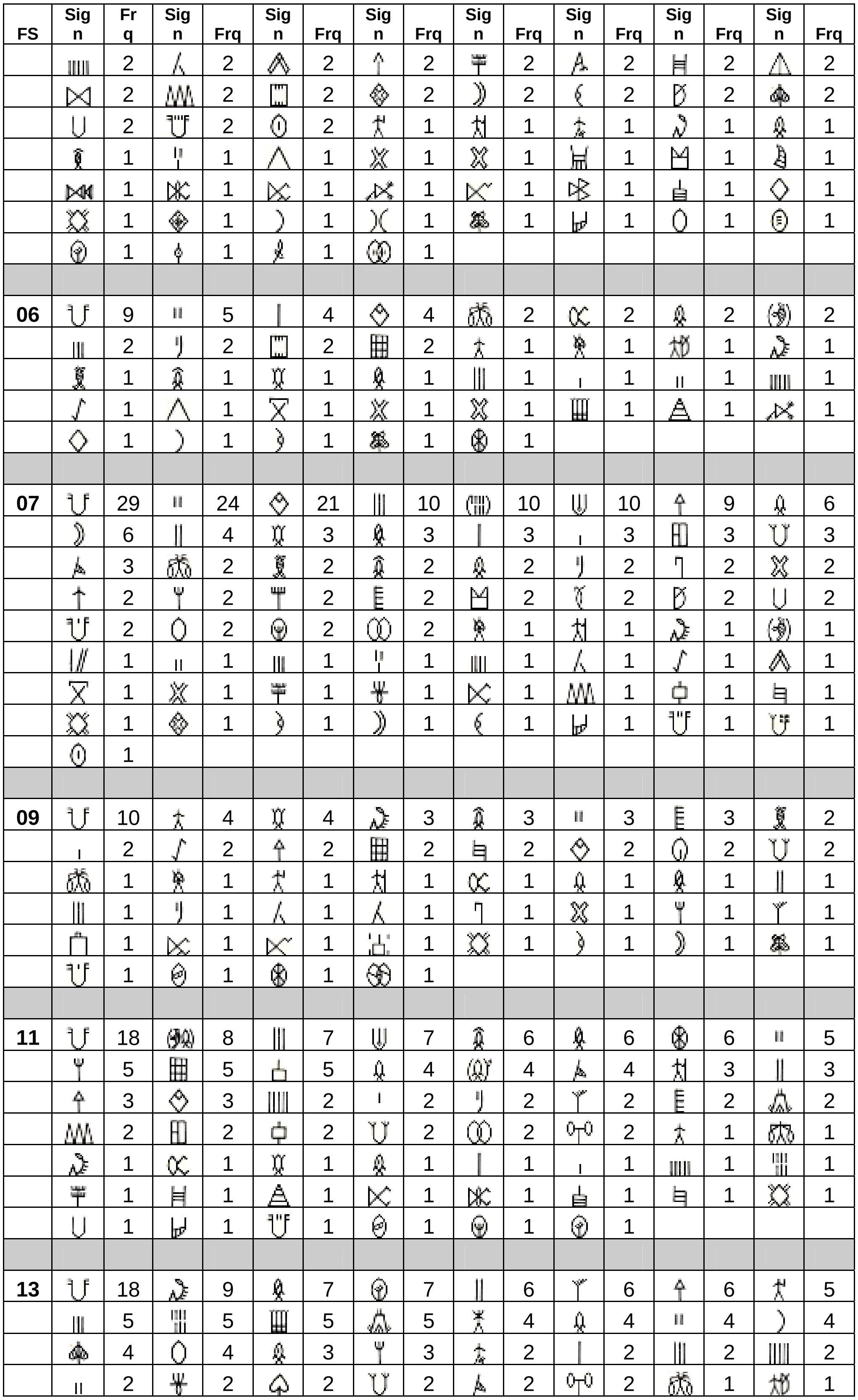

FS	Sign	Frq	Sign	Frq	Sign	Frq	Sign	Frq	Sign	Frq	Sign	Frq	Sign	Frq	Sign	Frq
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		2		2		2		2		2		2		2		2
		2		2		2		1		1		1		1		1
		1		1		1		1		1		1		1		1
		1		1		1		1		1		1		1		1
		1		1		1		1		1		1		1		1
		1		1		1		1								
06		9		5		4		4		2		2		2		2
		2		2		2		2		1		1		1		1
		1		1		1		1		1		1		1		1
		1		1		1		1		1		1		1		1
		1		1		1		1		1						
07		29		24		21		10		10		10		9		6
		6		4		3		3		3		3		3		3
		3		2		2		2		2		2		2		2
		2		2		2		2		2		2		2		2
		2		2		2		2		1		1		1		1
		1		1		1		1		1		1		1		1
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		1		1		1		1		1		1		1		1
		1														
09		10		4		4		3		3		3		3		2
		2		2		2		2		2		2		2		2
		1		1		1		1		1		1		1		1
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		1		1		1		1								
11		18		8		7		7		6		6		6		5
		5		5		5		4		4		4		3		3
		3		3		2		2		2		2		2		2
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		1		1		1		1		1		1		1		1
		1		1		1		1		1		1				
13		18		9		7		7		6		6		6		5
		5		5		5		5		4		4		4		4
		4		4		3		3		2		2		2		2
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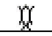
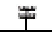
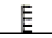
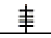
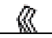
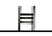
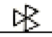
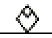
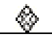
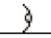
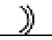
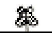
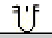
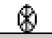
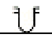
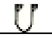
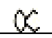
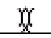
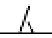
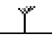
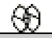
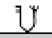
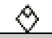
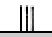
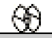
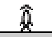
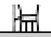
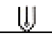
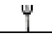
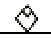
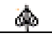
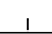
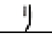
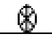
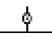
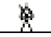
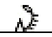
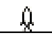
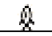
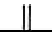
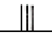
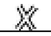
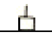
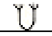
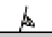
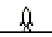
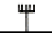
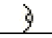
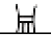
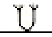
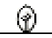
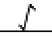
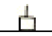
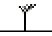
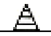
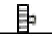
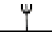
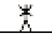
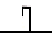
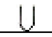
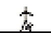
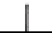
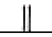
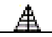
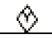
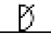
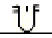
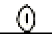
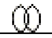
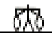
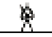
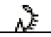
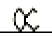
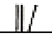
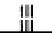
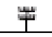
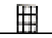
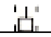
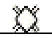
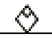
		1		1		1		1		1		1		1		1
		1		1		1		1		1		1		1		1
		1		1		1		1								
14		20		20		19		19		3		3		3		3
		3		3		1		1		1						
16		19		10		10		10		9		9				
25		10		7		6		4		4		4		3		2
		2		2		2		2		2		1		1		1
		1		1		1		1		1		1		1		1
		1		1		1										
36		38		17		17		14		12		11		11		11
		10		10		10		10		9		8		8		5
		5		3		3		3		3		2		2		2
		2		2		2		2		2		2		2		2
		2		2		1		1		1		1		1		1
		1		1		1		1		1		1		1		1
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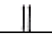
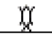
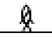
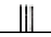
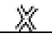
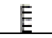
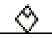
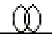
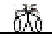
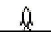
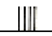
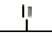
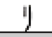
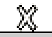
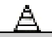
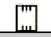
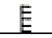
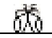
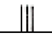
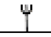
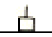
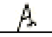
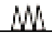
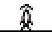
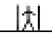
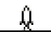
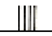
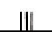
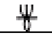
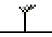
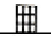
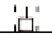
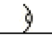
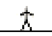
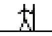
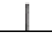
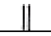
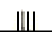
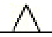
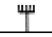
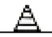
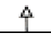
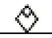
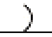
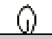
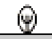
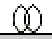
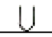
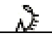
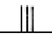
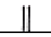
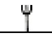
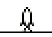
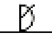
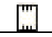
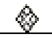
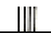
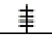
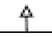
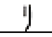
37		4		3		3		2		2		2		2		2
		2		2		2		2		1		1		1		1
		1		1		1		1		1		1				
44		13		12		11		7		7		7		7		6
		6		5		4		4		3		3		3		3
		3		3		2		2		2		2		2		2
		2		1		1		1		1		1		1		1
		1		1		1		1		1		1		1		1
		1		1		1		1		1						
83		33		28		23		15		15		12		10		7
		7		7		5		5		5		4		4		4
		3		3		3		3		2		2		2		2
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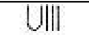
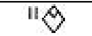
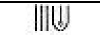
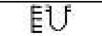
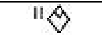
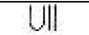
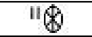
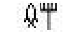
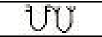
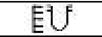
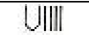
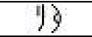
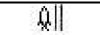
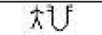
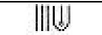
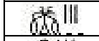
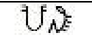
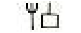
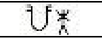
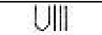
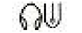
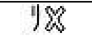
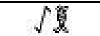
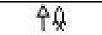
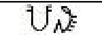
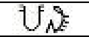
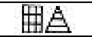
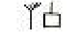
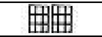
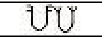
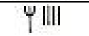
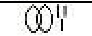
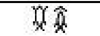
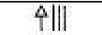
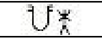
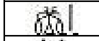
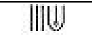
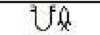
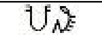
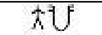
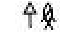
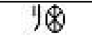
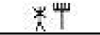
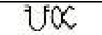
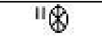
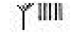
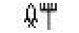
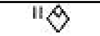
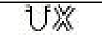
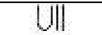
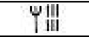
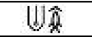
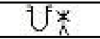
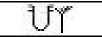
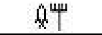
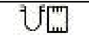
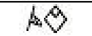
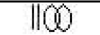
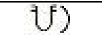
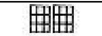
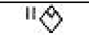
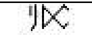
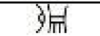
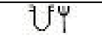
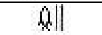
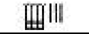
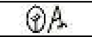
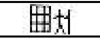
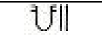
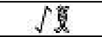
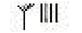
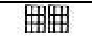
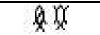
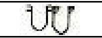
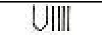
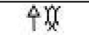
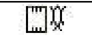
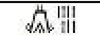
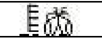
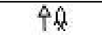
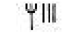
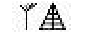
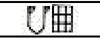
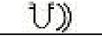
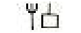
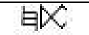
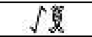
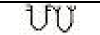
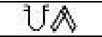
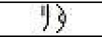
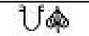
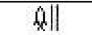
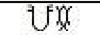
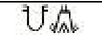
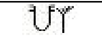
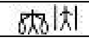
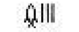
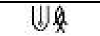
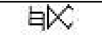
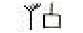
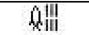
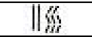
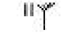
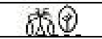
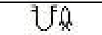
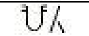
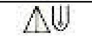
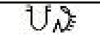
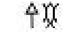
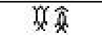
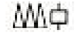
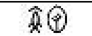
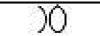
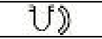
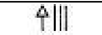
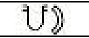
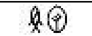
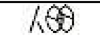
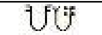
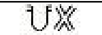
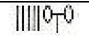
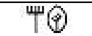
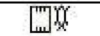
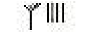
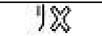
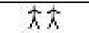
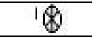
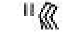
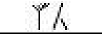
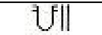
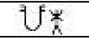
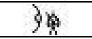
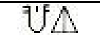
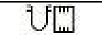
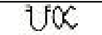
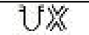
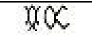
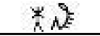
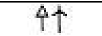
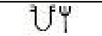
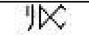
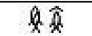
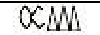
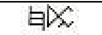
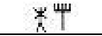
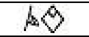
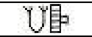
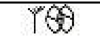
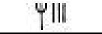
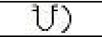
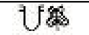
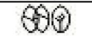
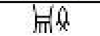
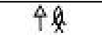
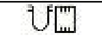
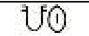
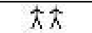
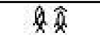
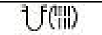
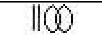
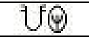
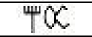
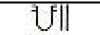
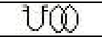
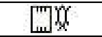
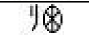
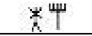
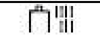
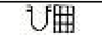
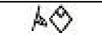
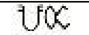
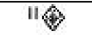
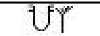
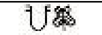
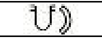
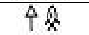
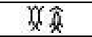
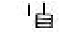
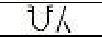
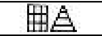
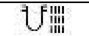
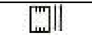
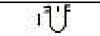
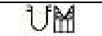
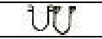
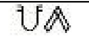
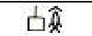
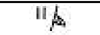
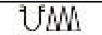
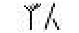
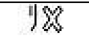
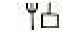
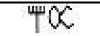
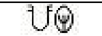
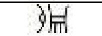
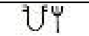
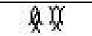
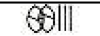
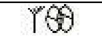
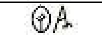
		1		1		1		1		1		1		1		1
		1		1		1		1		1		1		1		
85		8		8		6		5		5		4		4		4
		4		3		3		3		2		2		2		2

FS	Sign	Frq	Sign	Frq	Sign	Frq	Sign	Frq	Sign	Frq	Sign	Frq	Sign	Frq	Sign	Frq
		2		1		1		1		1		1		1		1
		1		1		1		1								
91		8		7		5		4		2		2		2		1
		1		1		1		1		1		1		1		1
		1														

Statement 2.1: Frequency Distribution of Frequent Pairs Within a Line of Text

(Minimum total frequency of pairs = 10)

Solus		Initial		Medial		Final		Total	
Pairs	Freq	Pairs	Freq	Pairs	Freq	Pairs	Freq	Pairs	Tot. Freq
	111		254		104		179		291
	74		73		55		88		184
	50		54		53		79		126
	11		52		44		66		124
	9		37		41		49		114
	8		29		40		42		110
	8		22		35		40		93
	7		22		34		37		87
	6		22		30		34		83
	6		21		26		34		78
	6		12		25		34		76
	6		20		24		34		70
	6		19		23		32		67
	5		17		21		29		58
	5		17		21		29		58
	4		16		21		25		55
	4		15		21		25		54
	4		14		21		22		54
	4		14		20		22		48
	3		12		18		22		47
	3		12		18		22		44
	3		12		17		21		44
	3		12		17		21		44
	3		12		17		19		44
	3		12		16		18		44
	2		12		16		18		42
	2		11		15		18		40
	2		11		14		17		40
	2		11		14		17		40
	2		11		14		16		37
	2		11		13		15		34
	2		10		13		15		34
	2		10		13		15		32
	2		10		13		14		32
	1		10		13		14		32
	1		9		13		12		31
	1		9		13		12		31
	1		8		13		12		30
	1		8		12		12		30
	1		7		12		12		29
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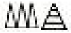
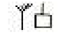
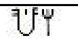
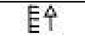
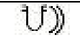
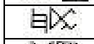
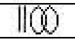
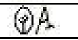
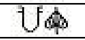
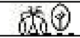
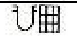
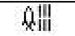
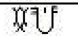
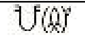
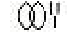
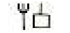
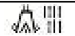
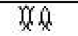
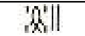
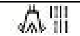
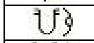
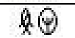
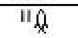
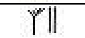
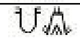
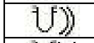
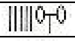
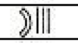
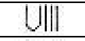
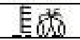
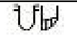
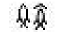
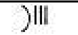
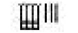
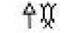
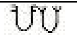
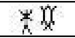
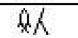
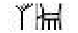
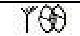
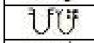
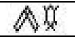
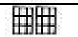
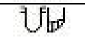
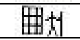
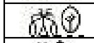
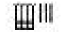
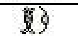
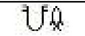
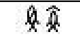
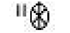
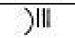
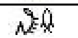
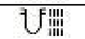
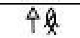
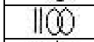
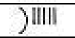
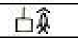
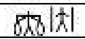
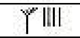
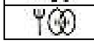
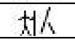
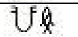
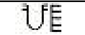
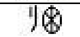
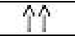
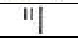
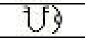
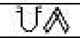
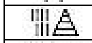
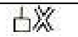
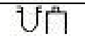
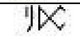
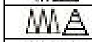
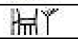
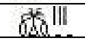
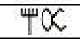
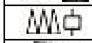
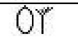
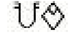
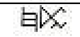
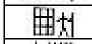
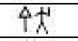
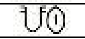
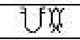
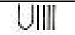
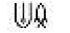
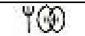
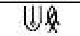
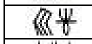
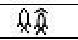
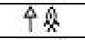
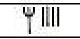
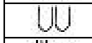
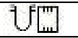
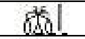
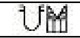
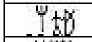
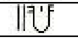
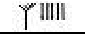
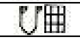
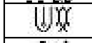
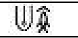
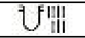
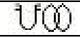
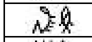
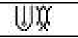
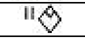
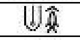
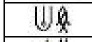
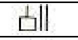
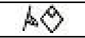
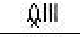
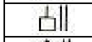
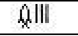
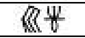
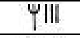
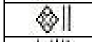
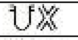
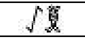
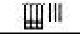
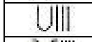
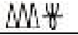
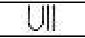
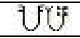
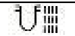
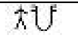
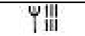
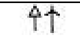
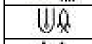
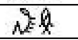
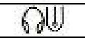
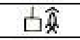
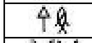
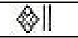
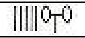
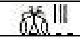
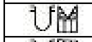
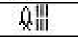
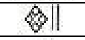
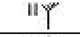
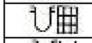
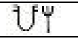
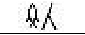
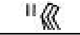
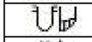
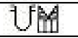
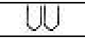
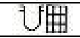
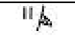
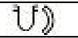
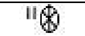
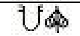
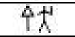
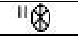
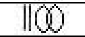
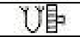
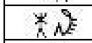
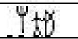
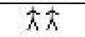
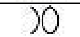
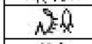
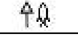
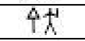
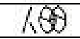
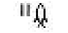
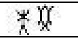
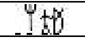
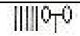
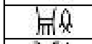
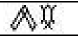
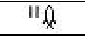
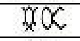
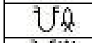
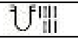
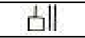
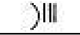
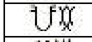
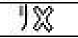
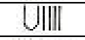
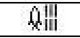
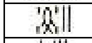
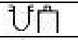
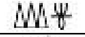
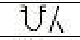
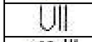
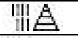
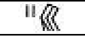
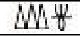
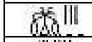
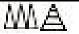
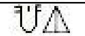
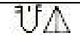
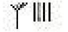
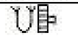
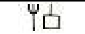
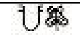
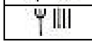
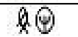
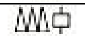
	1		7		12		11		28
	1		7		12		11		28
	1		6		12		10		27
	1		6		11		10		27
	1		6		11		10		27
	1		6		11		10		26
	1		5		11		10		26
	1		5		11		10		26
	1		5		11		10		25
	1		5		11		9		24
	1		5		10		9		24
	1		5		10		8		24
	1		5		10		8		24
			5		10		8		23
			5		10		7		23
			5		10		6		22
			5		10		6		22
			4		9		6		21
			4		9		6		21
			4		9		5		21
			4		9		5		21
			3		9		5		21
			3		8		5		21
			3		8		5		20
			3		8		5		20
			3		8		4		20
			3		8		3		20
			3		8		3		20
			3		8		3		19
			2		7		3		18
			2		7		3		18
			2		7		2		18
			2		7		2		18
			2		7		2		18
			2		7		2		18
			1		7		2		17
			1		6		1		17
			1		6		1		17
			1		6		1		17
			1		6		1		16
			1		6		1		16
			1		6		1		16
			1		6		1		16
			1		6		1		16
			1		6		1		16
			1		6		1		16
			1		6		1		16

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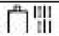
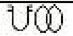
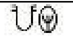
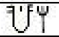
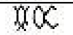
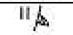
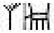
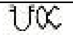
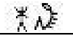
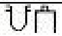
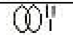
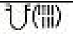
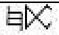
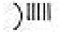
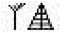
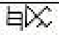
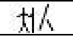
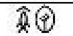
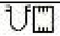
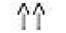
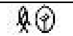
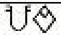
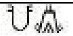
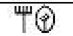
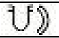
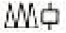
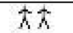
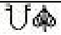
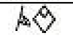
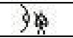
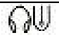
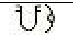
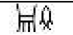
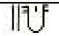
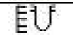
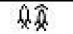
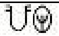
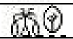
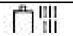
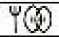
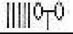
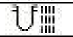
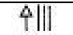
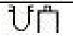
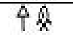
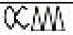
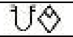
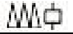
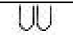
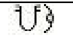
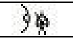
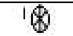
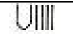
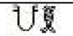
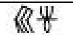
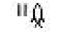
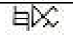
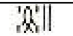
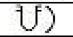
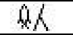
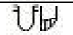
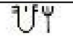
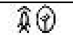
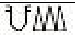
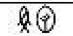
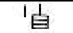
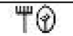
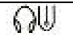
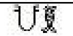
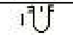
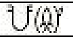
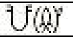
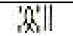
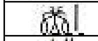
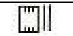
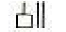
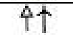
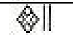
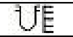
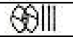
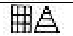
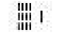
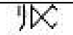
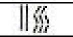
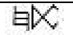
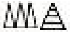
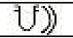
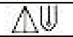
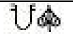
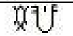
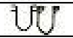
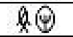
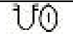
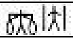
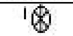
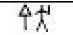
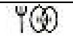
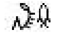
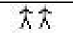
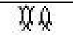
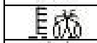
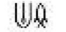
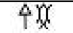
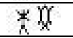
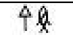
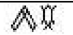
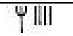
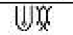
			1		6		1		16
			1		5				16
			1		5				15
			1		5				15
			1		5				15
			1		5				15
			1		5				15
			1		5				15
			1		5				14
			1		5				14
			1		5				14
			1		5				14
			1		5				14
			1		5				14
					4				14
					4				14
					4				14
					4				14
					3				14
					3				13
					3				13
					3				13
					3				13
					3				13
					3				13
					3				13
					3				13
					2				13
					2				12
					2				12
					2				12
					2				12
					2				12
					2				12
					2				12
					2				12
					2				12
					2				12
					2				12
					2				11
					2				11
					2				11
					1				11
					1				11
					1				11
					1				11
					1				11

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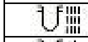
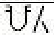
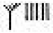
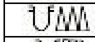
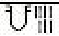
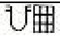
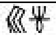
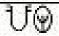
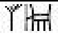
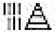
					1				11
					1				11
					1				11
					1				11
					1				11
									11
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								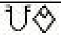	11
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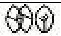
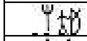
									11
									10
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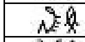
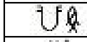
									10
									10
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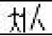
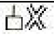
									10
									10
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								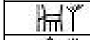	10
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								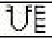	10
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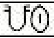
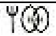
									10
									10

Statement 2.2: Frequency Distribution of Frequent Pairs by Major Sites (min. 100 inscriptions)

(Minimum total frequency of pairs= 10)

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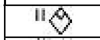
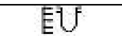
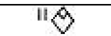
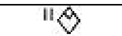
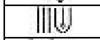
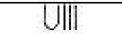
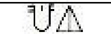
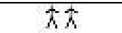
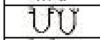
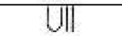
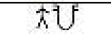
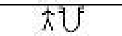
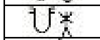
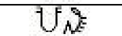
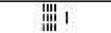
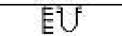
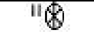
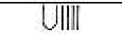
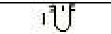
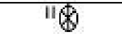
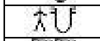
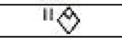
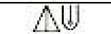
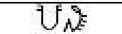
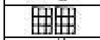
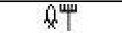
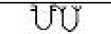
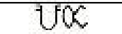
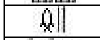
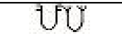
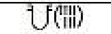
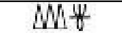
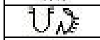
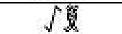
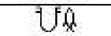
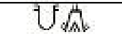
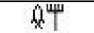
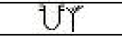
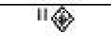
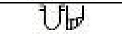
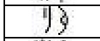
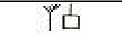
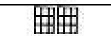
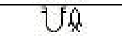
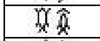
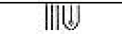
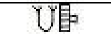
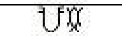
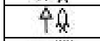
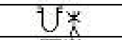
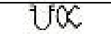
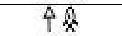
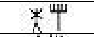
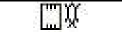
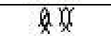
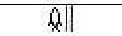
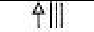
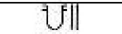
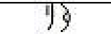
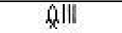
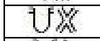
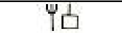
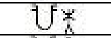
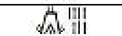
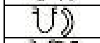
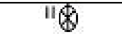
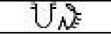
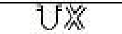
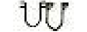
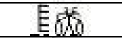
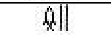
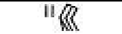
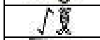
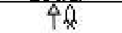
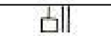
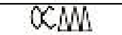
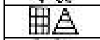
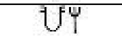
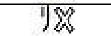
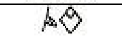
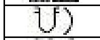
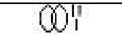
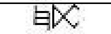
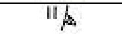
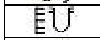
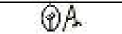
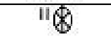
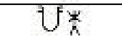
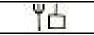
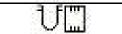
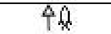
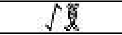
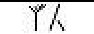
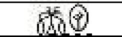
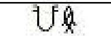
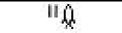
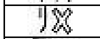
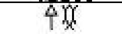
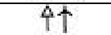
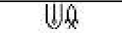
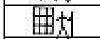
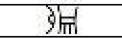
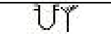
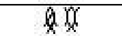
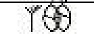
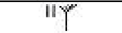
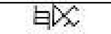
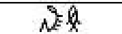
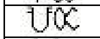
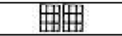
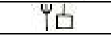
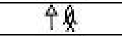
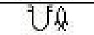
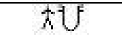
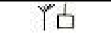
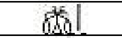
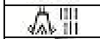
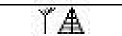
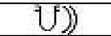
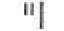
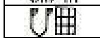
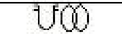
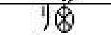
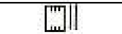
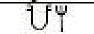
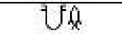
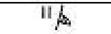
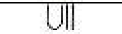
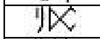
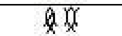
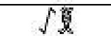
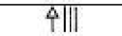
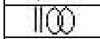
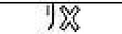
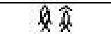
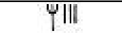
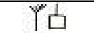
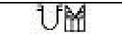
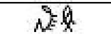
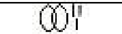
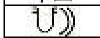
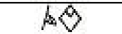
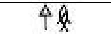
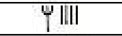
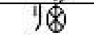
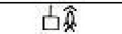
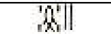
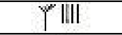
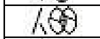
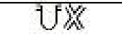
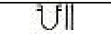
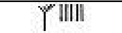
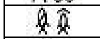
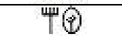
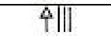
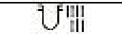
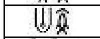
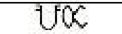
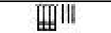
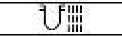
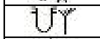
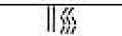
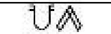
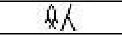
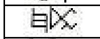
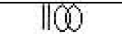
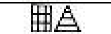
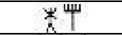
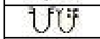
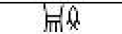
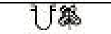
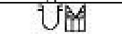
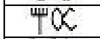
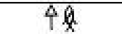
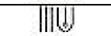
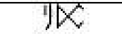
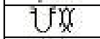
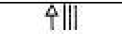
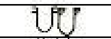
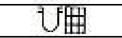
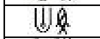
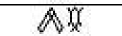
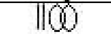
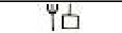
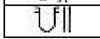
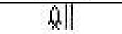
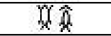
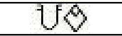
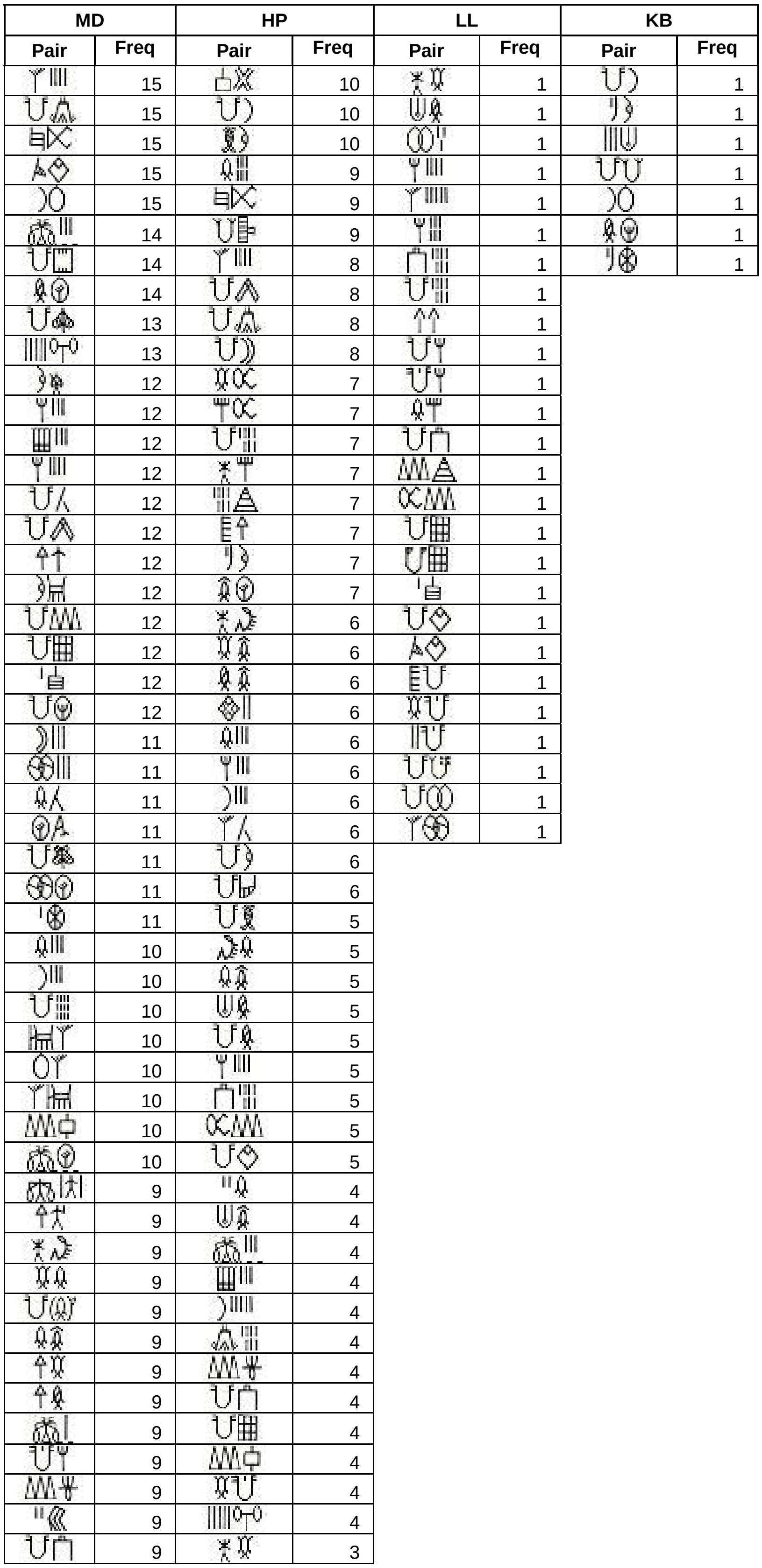
	177		150		33		8
	94		120		12		7
	65		77		12		7
	62		61		11		7
	52		54		11		5
	51		54		10		4
	47		33		10		3
	46		33		9		3
	42		28		8		3
	41		27		8		3
	36		26		6		2
	35		25		6		2
	32		23		5		2
	32		23		5		2
	29		23		5		2
	29		22		4		2
	29		21		4		2
	27		20		4		2
	26		20		4		2
	26		20		4		2
	26		18		4		2
	26		18		4		1
	25		18		3		1
	24		18		3		1
	24		17		3		1
	23		17		3		1
	22		16		3		1
	20		16		3		1
	20		16		3		1
	20		15		3		1
	20		15		3		1
	18		14		3		1
	18		14		2		1
	18		14		2		1
	17		14		2		1
	17		14		2		1
	17		13		2		1
	17		13		2		1
	16		13		2		1
	16		12		2		1
	16		12		2		1
	16		12		2		1
	16		11		2		1
	15		11		2		1
	15		11		2		1
	15		10		2		1
	15		10		1		1



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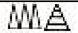
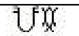
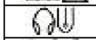
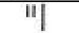
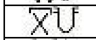
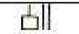
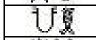
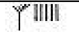
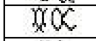
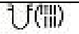
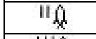
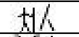
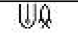
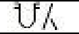
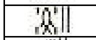
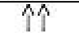
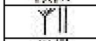
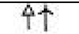
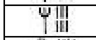
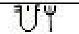
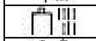
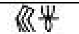
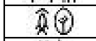
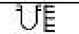
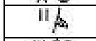
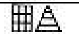
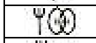
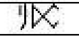
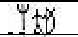
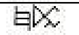
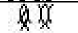
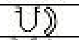
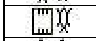
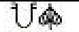
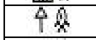
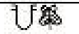
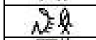
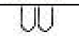
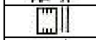
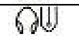
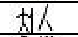
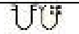
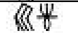
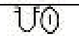
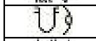
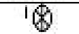
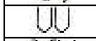
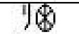
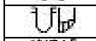
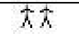
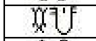
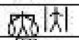
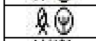
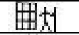
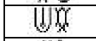
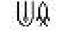
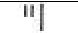
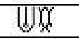
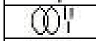
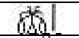
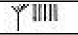
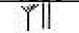
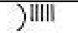
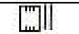
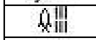
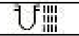
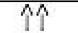
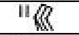
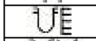
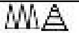
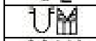
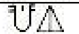
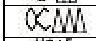
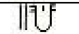
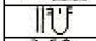
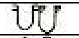
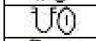
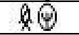
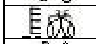
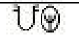
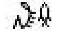
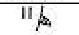
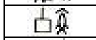
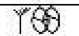
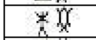
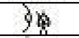
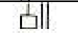
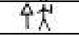
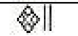
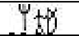
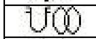
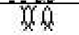
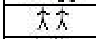
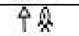
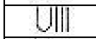
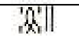
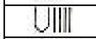
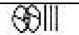
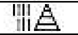
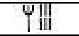
	9		3				
	9		3				
	9		3				
	8		3				
	8		3				
	8		3				
	8		3				
	8		3				
	8		3				
	8		3				
	8		3				
	8		3				
	8		3				
	8		3				
	7		3				
	7		3				
	7		3				
	7		3				
	7		3				
	7		3				
	7		3				
	7		3				
	7		3				
	7		3				
	7		2				
	7		2				
	7		2				
	6		2				
	6		2				
	6		2				
	6		2				
	6		2				
	6		2				
	6		2				
	6		2				
	6		2				
	6		2				
	6		2				
	6		2				
	5		2				
	5		2				
	5		2				
	5		1				
	5		1				
	5		1				
	5		1				
	4		1				
	4		1				
	4		1				
	4		1				

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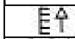
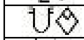
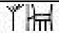
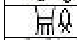
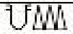
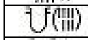
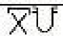
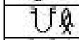
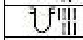
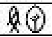
	4		1				
	4		1				
	3		1				
	3		1				
	2		1				
	2		1				
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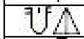
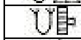
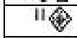
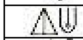
	2						
	2						
	2						
	2						
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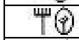
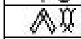
	2						
	1						
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	1						

Statement 2.3: Frequency Distribution of Frequent Pairs by Object Types (min. 100 inscriptions)

(Minimum total frequency of pairs = 10)

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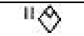
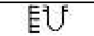
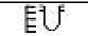
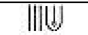
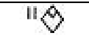
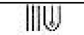
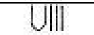
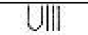
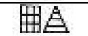
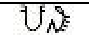
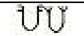
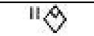
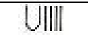
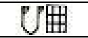
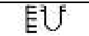
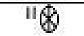
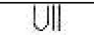
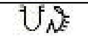
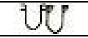
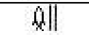
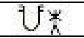
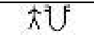
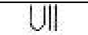
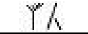
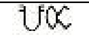
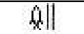
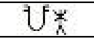
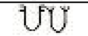
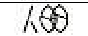
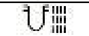
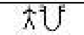
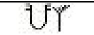
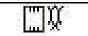
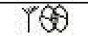
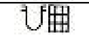
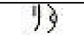
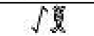
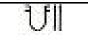
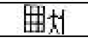
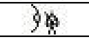
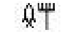
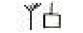
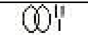
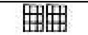
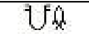
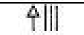
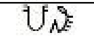
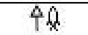
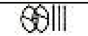
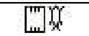
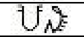
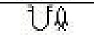
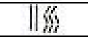
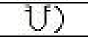
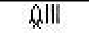
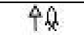
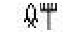
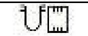
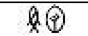
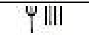
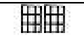
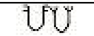
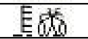
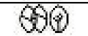
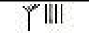
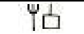
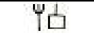
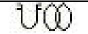
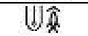
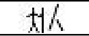
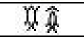
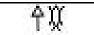
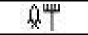
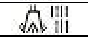
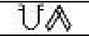
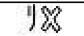
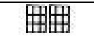
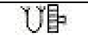
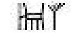
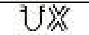
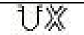
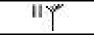
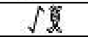
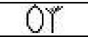
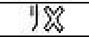
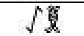
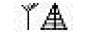
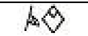
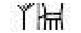
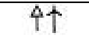
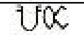
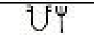
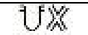
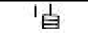
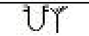
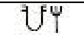
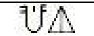
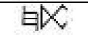
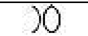
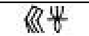
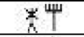
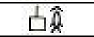
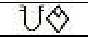
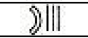
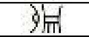
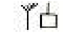
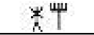
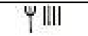
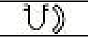
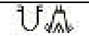
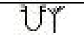
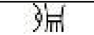
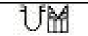
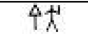
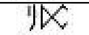
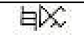
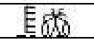
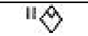
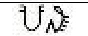
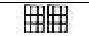
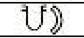
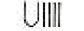
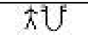
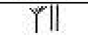
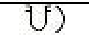
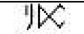
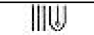
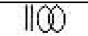
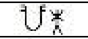
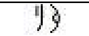
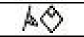
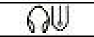
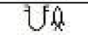
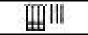
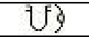
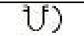
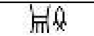
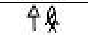
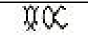
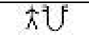
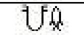
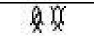
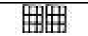
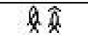
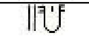
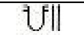
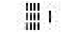
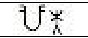
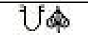
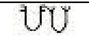
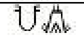
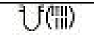
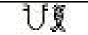
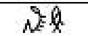
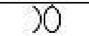
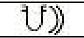
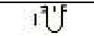
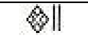
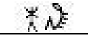
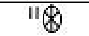
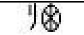
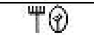
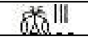
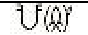
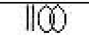
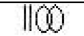
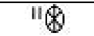
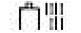
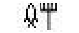
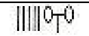
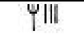
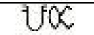
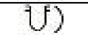
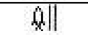
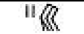
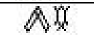
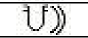
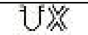
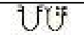
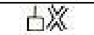
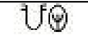
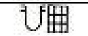
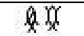
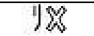
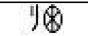
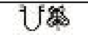
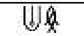
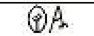
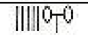
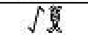
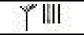
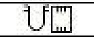
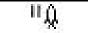
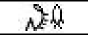
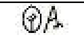
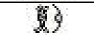
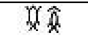
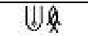
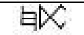
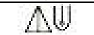
	234		71		90		27		5
	86		57		63		22		4
	71		44		45		20		4
	71		40		43		20		3
	61		24		38		17		2
	58		22		16		17		2
	56		22		15		15		2
	46		21		14		12		1
	43		21		12		12		1
	40		19		11		11		1
	38		19		11		11		1
	38		19		11		11		1
	38		19		10		11		1
	36		18		10		10		1
	33		16		9		10		1
	32		16		9		10		1
	29		15		7		10		1
	28		15		7		10		1
	28		14		5		10		1
	26		14		5		10		1
	25		13		5		9		1
	23		13		4		9		1
	22		13		4		8		1
	22		12		4		8		1
	22		12		4		8		1
	21		12		4		7		1
	21		12		3		7		1
	21		11		3		6		1
	20		11		3		6		1
	20		11		2		6		1
	20		11		2		5		1
	20		11		2		4		1
	20		11		2		4		1
	19		11		2		4		1
	18		10		2		3		
	18		10		2		3		
	18		10		2		3		
	17		10		2		3		
	17		10		2		2		
	17		10		1		2		
	17		10		1		2		
	17		10		1		2		
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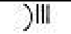
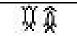
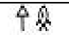
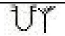
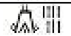
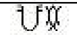
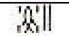
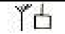
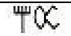
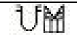
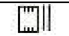
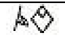
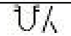
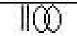
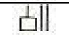
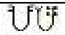
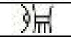
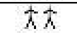
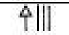
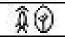
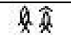
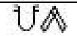
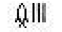
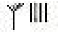
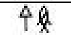
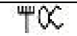
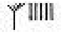
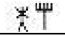
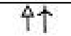
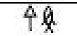
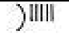
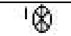
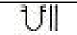
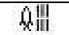
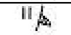
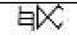
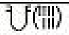
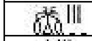
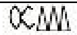
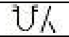
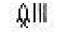
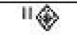
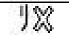
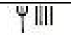
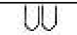
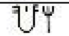
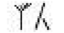
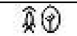
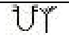
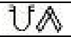
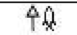
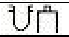
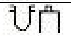
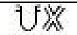
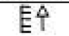
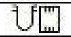
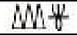
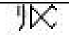
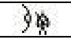
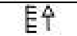
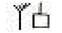
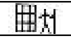
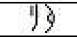
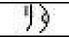
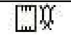
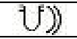
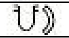
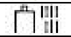
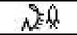
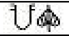
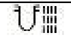
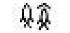
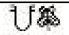
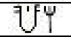
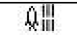
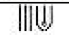
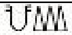
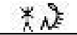
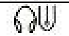
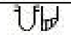
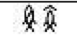
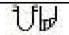
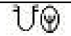
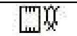
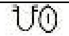
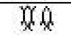
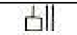
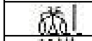
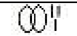
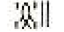
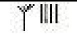
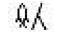
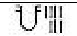
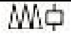
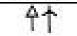
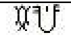
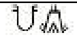
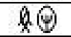
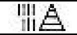
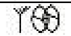
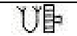
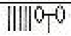
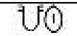
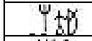
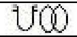
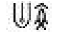
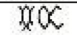
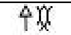
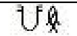
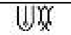
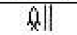
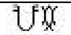
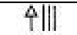
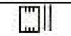
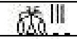
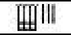
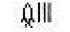
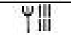
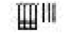
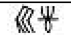
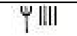
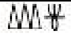
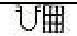
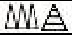
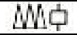
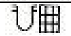
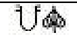
	16		9		1		2		
	16		9		1		2		
	15		9		1		2		
	15		9		1		2		
	15		8		1		2		
	14		8		1		1		
	14		7		1		1		
	14		7		1				
	14		7		1				
	14		7		1				
	13		7		1				
	13		7		1				
	13		7		1				
	13		7		1				
	13		6		1				
	13		6		1				
	13		6		1				
	12		6		1				
	12		6		1				
	12		6		1				
	12		5		1				
	12		5		1				
	12		5		1				
	12		4		1				
	12		4		1				
	12		4		1				
	11		4						
	11		4						
	11		4						
	11		4						
	11		4						
	11		4						
	11		4						
	11		4						
	11		4						
	10		4						
	10		3						
	10		3						
	10		3						
	10		3						
	10		3						
	10		3						
	10		3						
	10		3						
	10		3						
	10		3						
	10		3						

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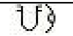
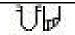
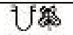
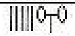
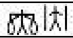
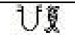
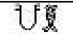
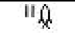
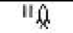
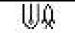
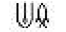
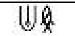
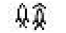
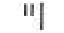
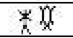
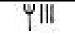
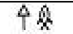
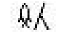
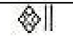
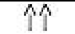
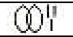
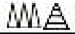
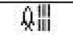
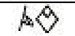
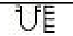
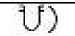
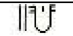
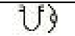
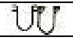
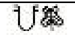
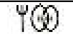
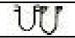
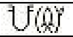
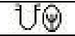
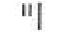
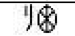
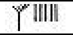
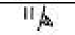
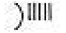
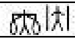
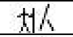
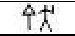
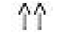
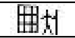
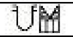
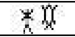
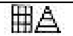
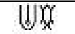
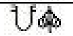
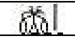
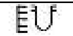
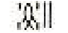
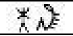
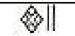
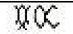
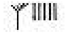
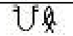
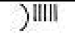
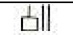
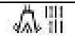
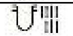
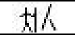
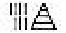
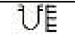
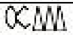
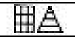
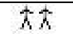
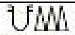
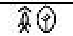
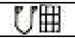
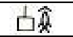
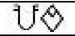
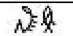
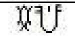
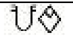
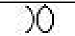
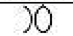
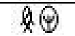
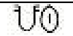
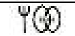
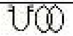
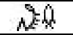
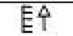
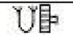
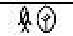
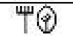
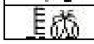
	10		3						
	10		3						
	9		2						
	9		2						
	9		2						
	9		2						
	9		2						
	9		2						
	9		2						
	9		2						
	9		2						
	9		2						
	9		2						
	9		2						
	9		2						
	9		2						
	8		2						
	8		2						
	8		2						
	8		1						
	8		1						
	8		1						
	8		1						
	8		1						
	8		1						
	8		1						
	7		1						
	7		1						
	7		1						
	7		1						
	7		1						
	7		1						
	7		1						
	6		1						
	6		1						
	5		1						
	5		1						
	5		1						
	5		1						
	5		1						
	5								
	4								
	4								
	4								
	4								
	4								
	3								

Seals		Sealings		Min. Tab.		Cop. Tab.		Pot. Graf.	
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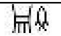
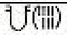
	3								
	3								
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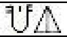
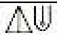
	2								
	2								
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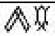
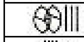
	1								
	1								
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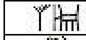
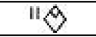
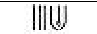
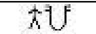
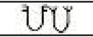
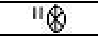
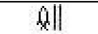
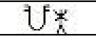
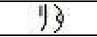
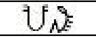
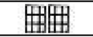
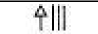
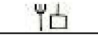
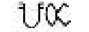
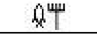
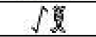
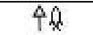
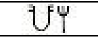
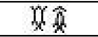
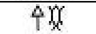
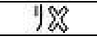
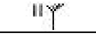
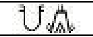
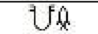
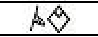
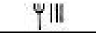
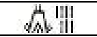
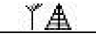
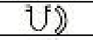
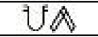
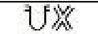
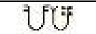
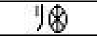
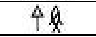
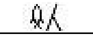
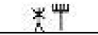
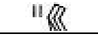
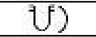
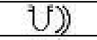
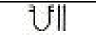
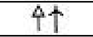
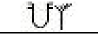
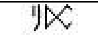
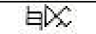
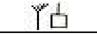
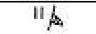
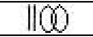
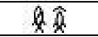
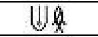
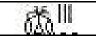
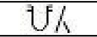
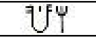
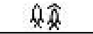
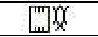
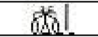
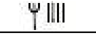
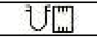
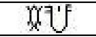
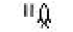
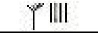
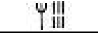
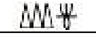
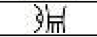
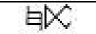
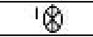
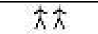
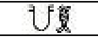
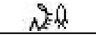
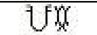
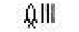
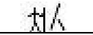
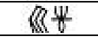
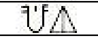
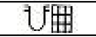
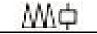
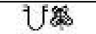
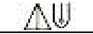
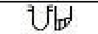
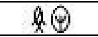
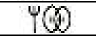
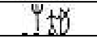
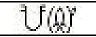
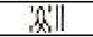
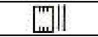
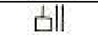
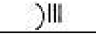
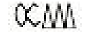
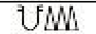
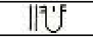
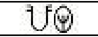
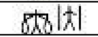
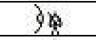
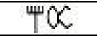
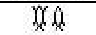
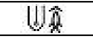
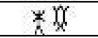
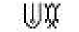
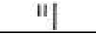
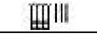
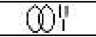
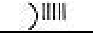
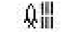
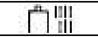
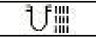
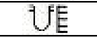
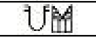
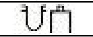
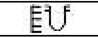
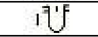
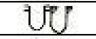
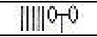
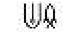
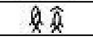
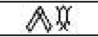
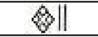
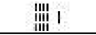
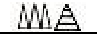
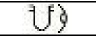
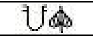
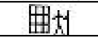
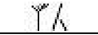
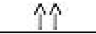
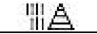
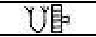
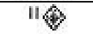
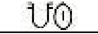
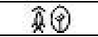
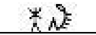
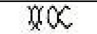
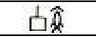
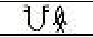
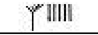
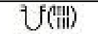
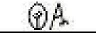
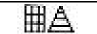
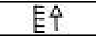
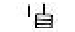
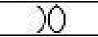
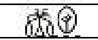
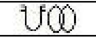
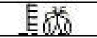
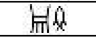
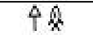
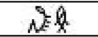
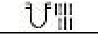
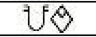
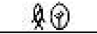
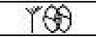
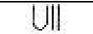
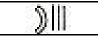
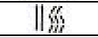
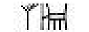
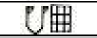
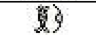
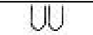
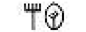
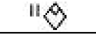
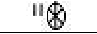
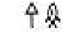
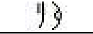
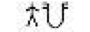
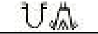
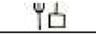
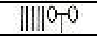
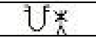
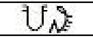
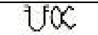
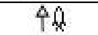
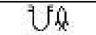
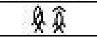
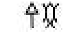
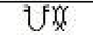
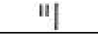
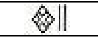
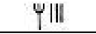
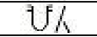
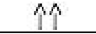
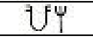
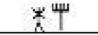
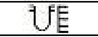
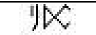
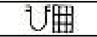
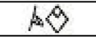
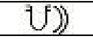
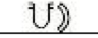
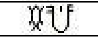
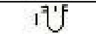
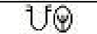
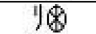
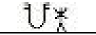
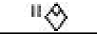
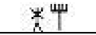
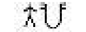
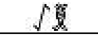
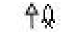
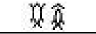
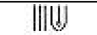
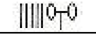
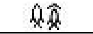
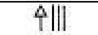
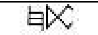
	1								
	1								

Statement 2.4: Frequency Distribution of Frequent Pairs by Field Symbols (min. frequency of FS = 10)

(minimum total frequency of pairs = 10)

FS	Pairs	Freq	Pairs	Freq	Pairs	Freq	Pairs	Freq	Pairs	Freq	Pairs	Freq
01		175		53		48		42		42		40
		34		34		33		31		29		28
		27		24		23		23		21		20
		19		19		18		17		16		16
		15		15		15		15		14		14
		14		14		13		13		13		13
		13		13		12		12		12		12
		12		12		12		12		11		11
		11		11		11		10		10		10
		10		10		10		9		9		9
		9		9		9		9		8		8
		8		8		8		8		8		8
		8		8		8		8		8		8
		8		7		7		7		7		7
		7		7		7		7		7		6
		6		6		6		6		6		6
		6		6		6		6		6		6
		6		6		6		6		6		6
		6		6		5		5		5		5
		5		5		5		5		4		4
		4		4		4		4		4		4
		3		3		3		3		3		3
		3		3		3		3		3		3
		3		2		2		2		2		2
		2		2		2		1		1		1
		1		1		1		1		1		
03		8		4		3		3		3		2
		2		2		1		1		1		1
		1		1		1		1		1		1
		1		1		1		1		1		1
		1		1		1		1		1		1
		1		1		1						
04		9		9		6		5		4		4
		4		4		4		3		3		3
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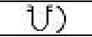
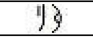
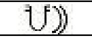
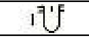
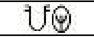
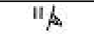
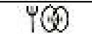
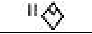
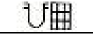
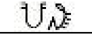
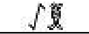
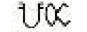
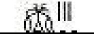
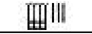
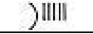
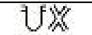
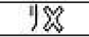
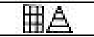
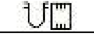
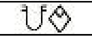
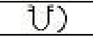
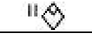
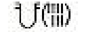
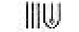
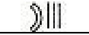
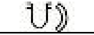
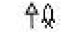
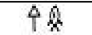
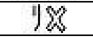
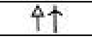
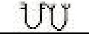
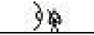
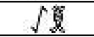
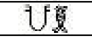
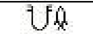
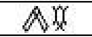
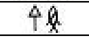
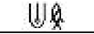
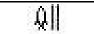
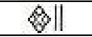
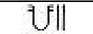
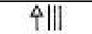
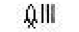
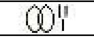
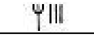
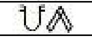
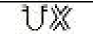
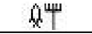
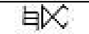
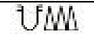
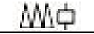
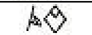
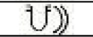
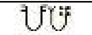
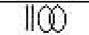
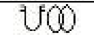
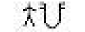
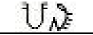
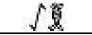
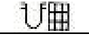
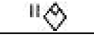
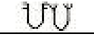
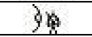
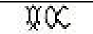
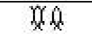
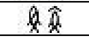
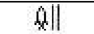
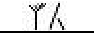
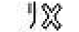
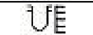
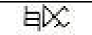
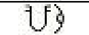
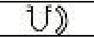
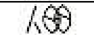
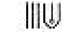
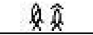
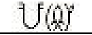
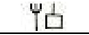
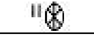
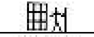
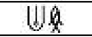
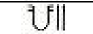
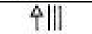
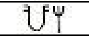
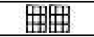
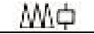
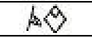
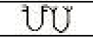
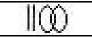
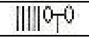
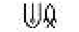
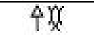
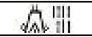
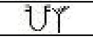
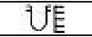
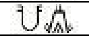
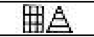
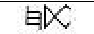
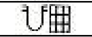
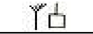
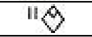
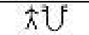
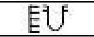
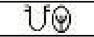
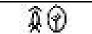
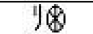
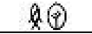
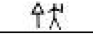
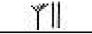
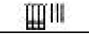
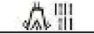
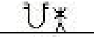
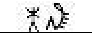
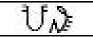
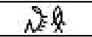
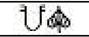
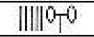
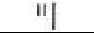
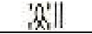
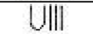
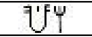
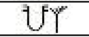
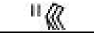
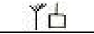
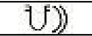
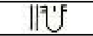
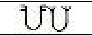
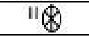
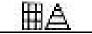
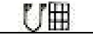
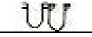
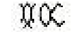
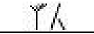
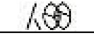
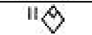
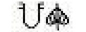
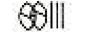
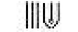
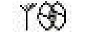
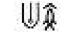
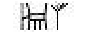
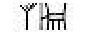
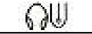
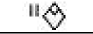
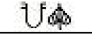
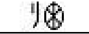
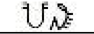
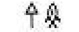
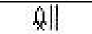
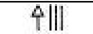
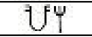
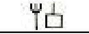
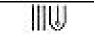
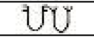
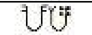
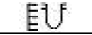
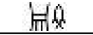
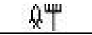
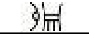
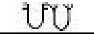
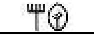
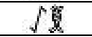
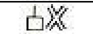
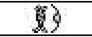
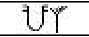
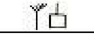
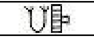
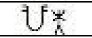
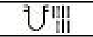
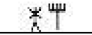
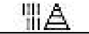
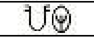
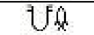
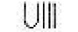
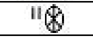
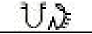
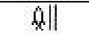
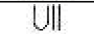
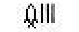
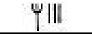
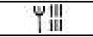
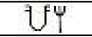
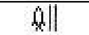
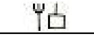
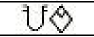
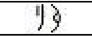
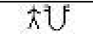
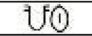
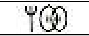
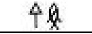
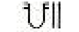
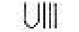
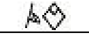
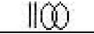
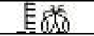
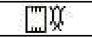
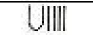
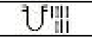
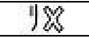
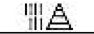
		1		1		1		1		1		1
		1										
06		3		2		1		1		1		1
		1		1		1		1		1		1
		1		1								
07		19		9		9		6		6		3
		2		2		2		2		1		1
		1		1		1		1		1		1
		1		1		1		1		1		1
		1		1		1		1		1		1
		1		1		1		1		1		
09		4		2		2		2		2		2
		1		1		1		1		1		1
		1		1		1		1		1		1
11		7		6		4		3		3		2
		2		2		2		2		2		2
		2		2		2		2		1		1
		1		1		1		1		1		1
		1		1		1		1		1		1
		1		1								
13		7		5		5		5		5		4
		4		4		4		3		2		1
		1		1		1		1		1		1
		1		1		1		1				
14		19		19		19		3		3		3
		1		1								
16		10		10		10		9		9		9
25		6		4		3		2		1		1
		1		1		1		1		1		1
		1										
36		15		11		11		11		11		11
		10		10		10		9		9		8
		3		3		3		3		3		2
		2		2		1		1		1		1
		1		1		1		1		1		1
		1		1		1		1				
37		2		2		2		2		2		1
		1		1		1		1		1		1
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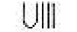
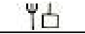
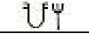
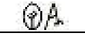
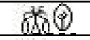
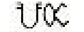
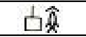
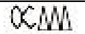
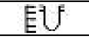
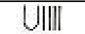
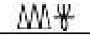
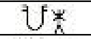
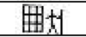
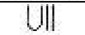
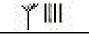
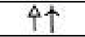
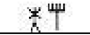
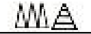
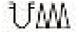
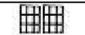
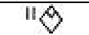
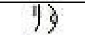
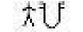
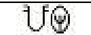
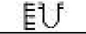
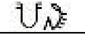
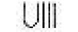
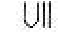
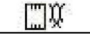
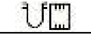
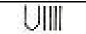
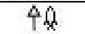
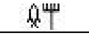
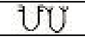
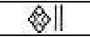
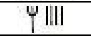
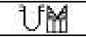
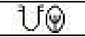
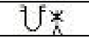
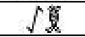
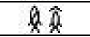
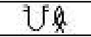
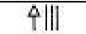
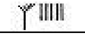
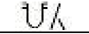
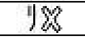
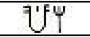
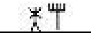
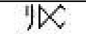
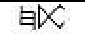
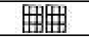
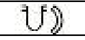
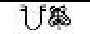
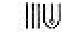
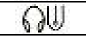
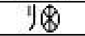
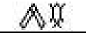
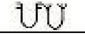
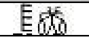
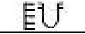
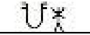
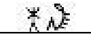
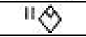
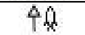
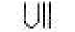
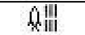
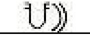
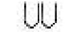
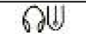
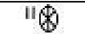
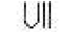
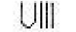
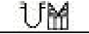
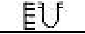
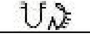
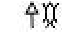
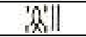
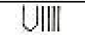
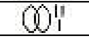
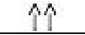
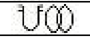
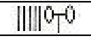
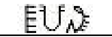
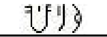
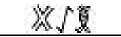
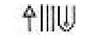
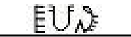
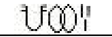
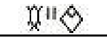
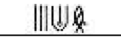
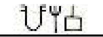
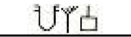
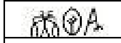
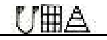
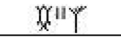
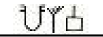
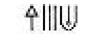
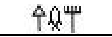
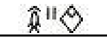
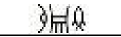
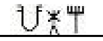
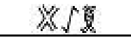
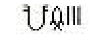
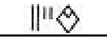
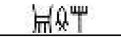
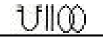
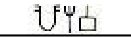
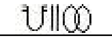
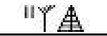
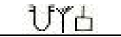
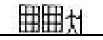
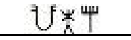
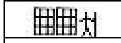
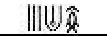
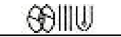
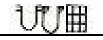
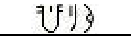
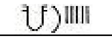
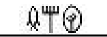
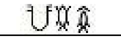
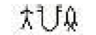
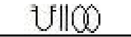
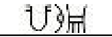
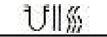
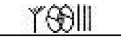
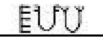
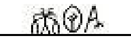
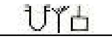
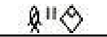
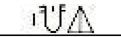
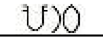
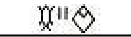
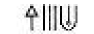
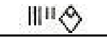
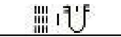
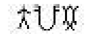
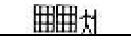
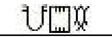
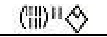
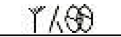
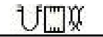
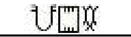
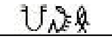
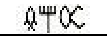
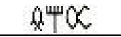
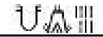
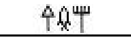
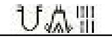
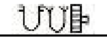
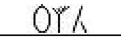
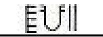
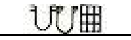
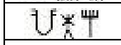
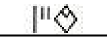
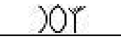
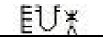
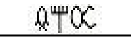
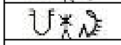
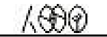
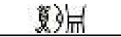
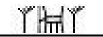
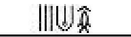
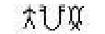
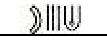
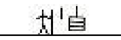
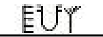
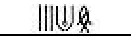
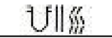
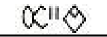
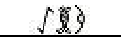
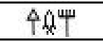
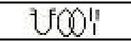
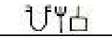
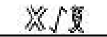
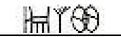
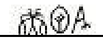
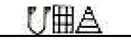
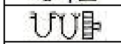
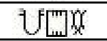
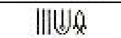
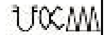
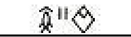
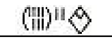
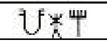
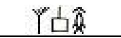
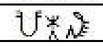
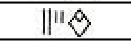
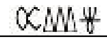
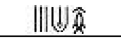
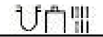
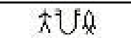
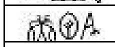
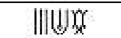
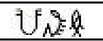
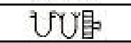
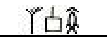
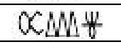
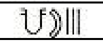
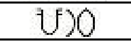
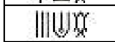
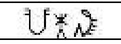
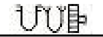
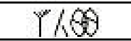
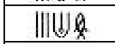
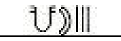
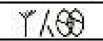
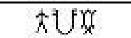
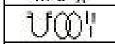
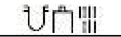
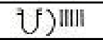
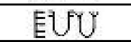
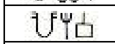
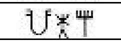
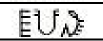
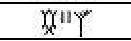
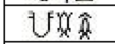
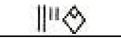
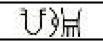
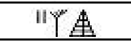
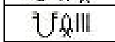
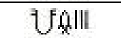
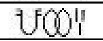
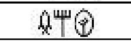
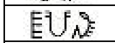
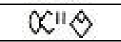
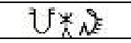
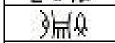
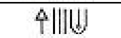
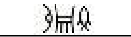
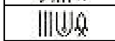
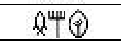
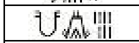
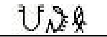
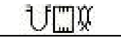
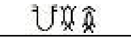
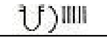
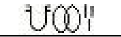
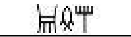
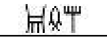
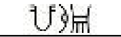
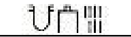
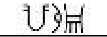
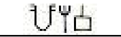
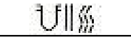
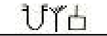
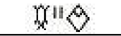
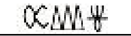
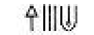
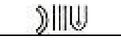
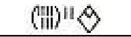
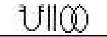
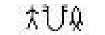
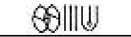
44		7		7		6		6		6		4
		4		4		4		3		3		1
		1		1		1		1		1		1
		1		1		1		1		1		1
83		19		14		13		8		5		5
		4		3		3		3		2		2
		2		2		1		1		1		1
		1		1		1		1		1		1
		1		1		1		1		1		1
		1		1								
85		4		4		3		3		2		2
		2		1		1		1		1		1
		1		1								
91		5		2		2		2		1		1
		1		1		1		1		1		1

Statement 3.1: Frequency Distribution of Frequent Triplets Within a Line of Text

(Minimum total frequency of triplets = 10)

Solus		Initial		Medial		Final		Total	
Triplets	**Freq**	**Triplets**	**Freq**	**Triplets**	**Freq**	**Triplets**	**Freq**	**Triplets**	**Freq**
	41		30		31		36		46
	14		25		17		31		44
	12		20		15		27		44
	11		19		13		25		37
	5		16		12		21		37
	5		15		12		20		36
	4		12		12		20		30
	4		12		11		17		28
	4		11		11		16		27
	4		11		11		16		27
	4		11		11		15		24
	3		11		11		13		24
	2		10		10		12		21
	2		10		10		11		21
	2		10		10		10		20
	1		10		10		10		20
	1		9		10		10		20
	1		7		10		10		20
	1		6		10		10		20
	1		6		9		10		20
	1		5		8		7		20
			5		8		7		18
			5		7		6		17
			3		7		6		17
			3		6		6		17
			3		5		6		16
			3		5		5		16
			3		4		4		15
			2		4		4		15
			2		3		1		15
			1		3				14
			1		3				14
			1		3				14
			1		2				13
			1		2				13
			1		2				12
			1		2				12
			1		2				12
			1		2				12
			1		1				12

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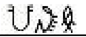
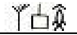
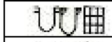
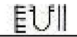
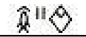
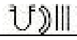
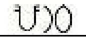
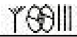
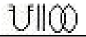
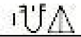
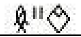
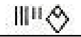
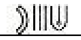
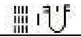
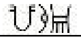
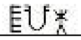
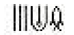
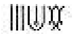
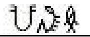
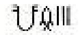
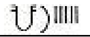
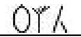
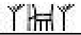
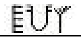
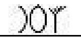
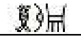
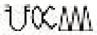
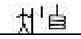
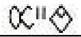
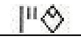
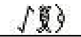
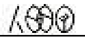
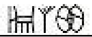
					1				11
					1				11
					1				11
					1				11
					1				11
									11
									11
									11
									11
									11
									10
									10
									10
									10
									10
									10
									10
									10
									10
									10
									10
									10
									10
									10
									10
									10
									10
									10

Statement 3.2: Frequency Distribution of Frequent Triplets by Major Sites (min. 100 inscriptions)

(Minimum total frequency of triplets = 10)

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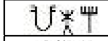
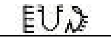
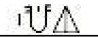
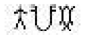
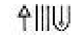
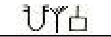
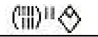
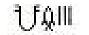
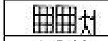
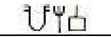
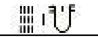
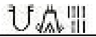
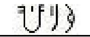
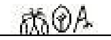
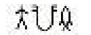
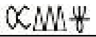
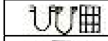
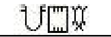
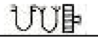
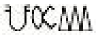
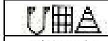
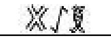
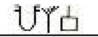
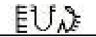
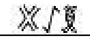
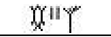
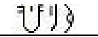
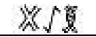
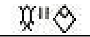
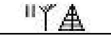
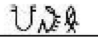
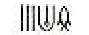
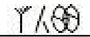
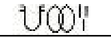
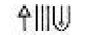
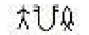
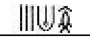
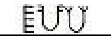
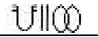
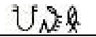
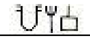
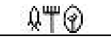
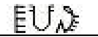
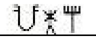
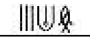
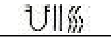
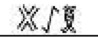
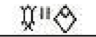
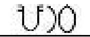
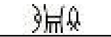
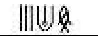
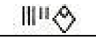
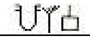
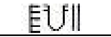
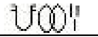
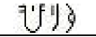
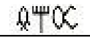
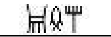
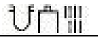
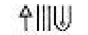
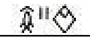
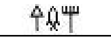
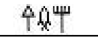
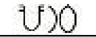
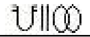
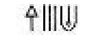
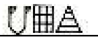
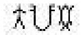
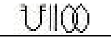
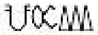
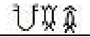
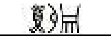
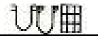
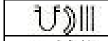
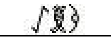
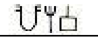
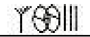
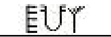
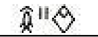
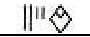
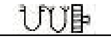
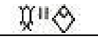
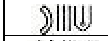
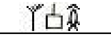
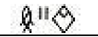
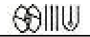
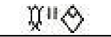
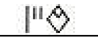
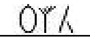
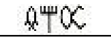
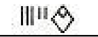
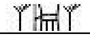
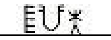
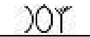
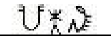
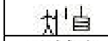
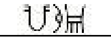
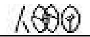
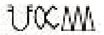
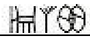
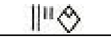
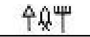
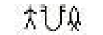
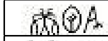
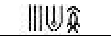
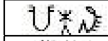
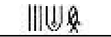
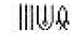
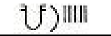
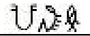
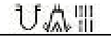
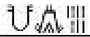
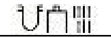
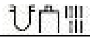
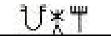
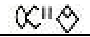
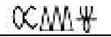
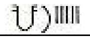
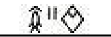
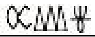
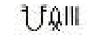
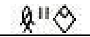
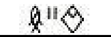
	31		42		11		2
	29		26		11		2
	22		19		11		2
	21		18		8		2
	20		17		6		2
	19		16		3		1
	18		15		3		1
	17		15		2		1
	17		14		2		1
	16		13		2		1
	16		13		1		1
	15		12		1		1
	15		11		1		1
	14		11		1		1
	13		11		1		1
	13		11		1		1
	13		11		1		
	12		11		1		
	11		10		1		
	11		10		1		
	11		9		1		
	11		9		1		
	11		8		1		
	11		8		1		
	10		7		1		
	10		6				
	10		6				
	10		5				
	10		5				
	10		5				
	9		4				
	9		4				
	8		4				
	8		4				
	7		4				
	7		4				
	7		4				
	7		4				
	6		4				
	6		3				
	6		3				

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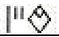
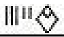
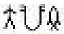
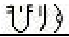
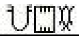
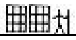
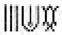
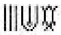
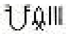
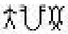
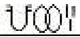
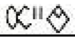
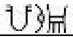
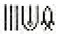
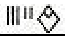
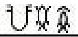
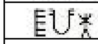
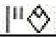
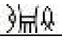
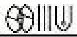
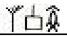
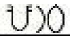
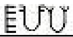
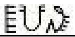
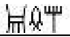
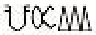
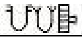
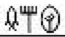
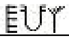
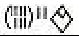
	6		3				
	5		3				
	5		2				
	5		2				
	5		2				
	5		2				
	5		1				
	5		1				
	4		1				
	3		1				
	3		1				
	3						
	2						
	2						
	2						
	2						
	2						
	1						
	1						

Statement 3.3: Frequency Distribution of Frequent Triplets by Object Types (min.100 inscriptions)

(Minimum total frequency of triplets = 10)

Seals		Sealings		Min. Tab.		Cop. Tab.		Pot. Grafi.	
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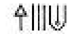
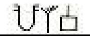
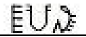
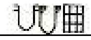
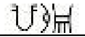
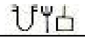
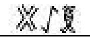
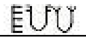
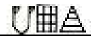
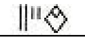
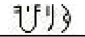
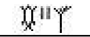
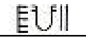
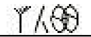
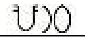
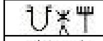
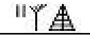
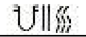
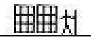
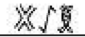
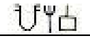
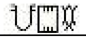
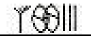
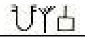
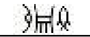
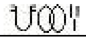
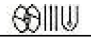
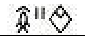
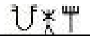
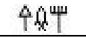
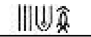
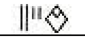
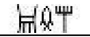
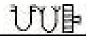
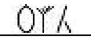
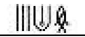
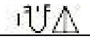
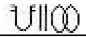
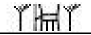
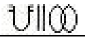
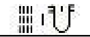
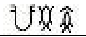
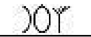
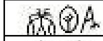
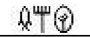
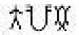
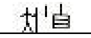
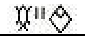
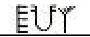
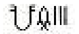
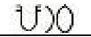
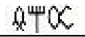
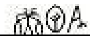
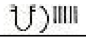
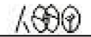
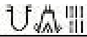
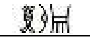
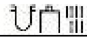
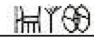
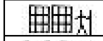
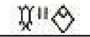
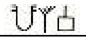
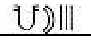
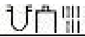
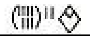
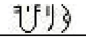
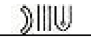
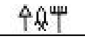
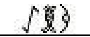
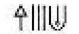
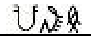
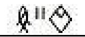
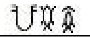
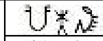
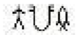
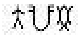
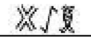
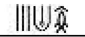
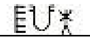
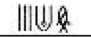
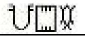
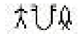
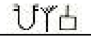
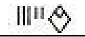
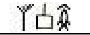
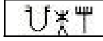
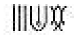
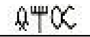
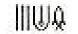
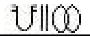
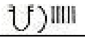
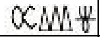
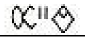
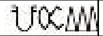
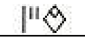
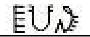
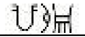
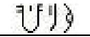
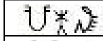
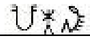
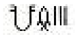
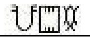
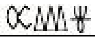
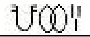
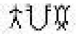
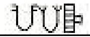
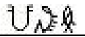
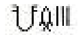
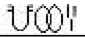
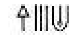
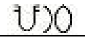
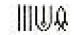
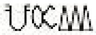
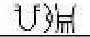
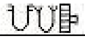
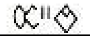
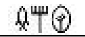
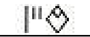
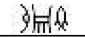
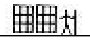
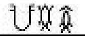
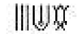
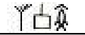
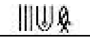
	40		21		38		20		1
	24		15		12		19		1
	24		15		11		17		1
	23		15		11		12		
	20		13		10		11		
	20		11		9		11		
	20		11		9		10		
	19		11		9		10		
	17		11		3		10		
	17		11		1		10		
	16		11		1		10		
	16		10		1		10		
	13		10		1		10		
	13		10		1		10		
	11		10		1		9		
	11		10		1		9		
	11		10		1		5		
	11		9				4		
	10		9				2		
	10		8				2		
	10		8				2		
	10		8				1		
	9		7						
	8		7						
	8		6						
	8		6						
	8		5						
	7		5						
	6		4						
	6		4						
	6		4						
	5		4						
	5		3						
	5		3						
	5		2						
	4		2						
	4		2						
	4		2						
	3		1						
	3		1						
	3		1						

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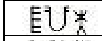
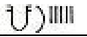
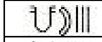
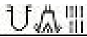
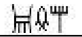
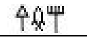
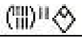
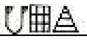
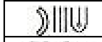
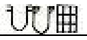
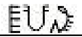
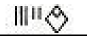
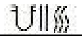
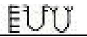
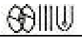
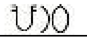
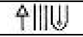
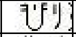
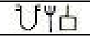
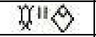
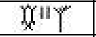
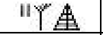
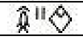
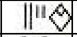
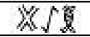
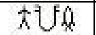
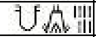
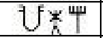
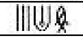
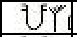
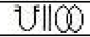
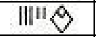
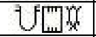
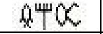
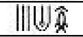
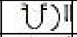
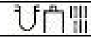
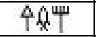
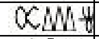
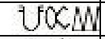
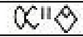
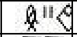
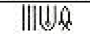
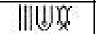
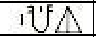
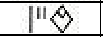
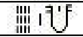
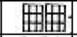
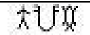
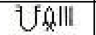
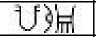
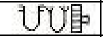
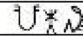
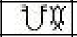
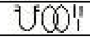
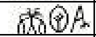
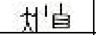
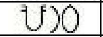
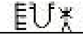
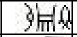
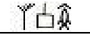
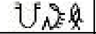
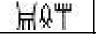
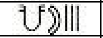
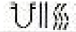
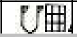
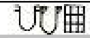
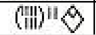
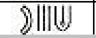
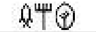
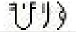
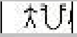
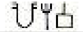
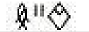
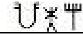
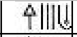
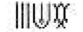
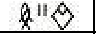
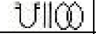
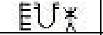
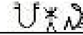
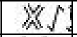
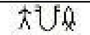
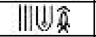
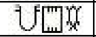
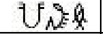
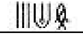
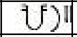
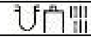
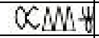
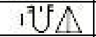
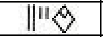
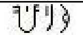
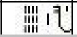
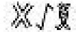
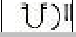
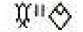
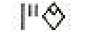
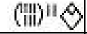
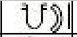
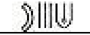
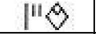
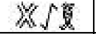
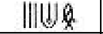
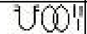
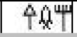
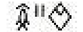
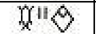
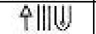
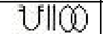
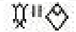
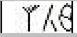
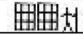
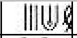
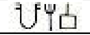
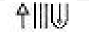
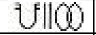
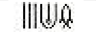
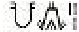
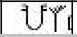
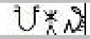
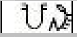
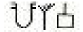
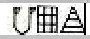
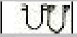
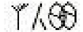
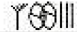
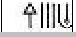
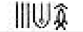
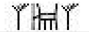
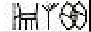
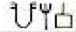
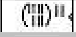
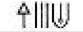
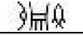
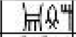
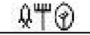
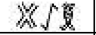
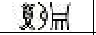
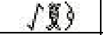
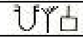
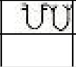
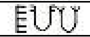
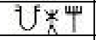
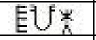
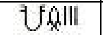
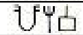
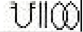
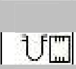
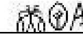
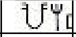
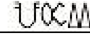
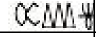
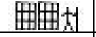
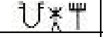
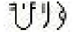
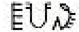
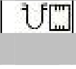
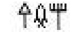
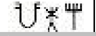
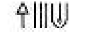
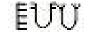
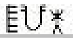
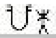
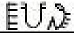
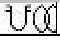
Triplets	Freq	Triplets	Freq	Triplets	Freq	Triplets	Freq	Triplets	Freq
	2		1						
	2		1						
	2		1						
	2		1						
	2		1						
	1		1						
	1		1						
	1		1						

Statement 4.3: Frequency Distribution of Frequent Triplets by Field Symbols (min, frequency of FS = 10)
(Minimum total frequency of triplets = 10)

FS	Triplet	Frq	Triplet	Freq	Triplet	Freq	Triplet	Freq	Triplet	Freq	Triplet	Freq
01		29		20		19		17		15		15
		14		14		13		13		13		13
		11		11		10		9		8		6
		6		6		6		6		6		6
		6		6		5		5		5		5
		5		4		4		4		4		4
		3		3		3		3		3		3
		2		2		2		2		2		1
		1		1		1		1		1		1
03		2		1		1		1				
04		5		3		2		2		2		1
		1		1		1		1		1		1
		1		1		1		1		1		1
		1		1								
06		1		1		1		1				
07		10		6		6		2		1		1
		1		1		1		1		1		1
09		2		1								
11		2		2		2		2		2		1
		1		1								
13		4		4		1						
14		19		19		3						
16		10		10		9		9		9		
25		1		1		1						
36		11		11		11		10		10		10
		9		8		8		3		2		1
		1										
37		2		1								
44		6		6		4		3		1		1
		1										
83		11		5		3		1		1		1

85		2		2								
91		1		1								