PROPOSAL SUMMARY FORM
Proposal L2/02-273

L2/02-318

A. Administrative

1.Title:
Proposal for encoding additional Greek numerical characters in the UCS
2. Requester's name:
Thesaurus Linguae Graecae Project (University of California, Irvine)
3. Requester type:
Expert contribution
4. Submission date:
2002-8-21
5. Requester's reference
6. Completion
This is a complete proposal. Documentation available at:
http://www.tlg.uci.edu/~tlg/Uni.prop.html
Additional information may be provided upon request.

B. Technical - General

1b. The proposal is for addition of character(s) to an existing block:
Name of the existing block:
Greek and Coptic
2. Number of characters in proposal:
51 new characters
9 definitions of existing characters
3. Proposed category
Categories C
4. Proposed Level of Implementation (1, 2 or 3):
Level 1
5a. Character names provided?
Yes.
5b. Character names in accordance with guidelines
Yes.
5c. Character shapes reviewable?
Yes
6a. Who will provide the appropriate computerized font for publishing the standard?
TLG Project
6b. Fonts currently available.
A number of Greek Unicode fonts are already available and listed at:
http://www.tlg.uci.edu/help/UnicodeTest.html. Additional symbols for new characters to be added.
6c. Font format
True Type
7a. Are references (to other character sets, dictionaries, descriptive texts etc.) provided?
Yes
7b. Are published examples of use of proposed characters attached?
Yes.
8. Does the proposal address other aspects of character data processing
No.

C. Technical - Justification

1. Has this proposal for addition of character(s) been submitted before?

No.

2. Has contact been made to members of the user community

Yes.The TLG has been in contact with a great number of experts in the field of Classics including textual criticism, papyrology, epigraphy, numismatics and historical linguistics. Earlier versions of this proposal have been posted online and received comments by members of the profession.

3. Information on the user community for the proposed characters

Scholarly community and individuals interested in Greek literature.

4. The context of use for the proposed characters (type of use; common or rare)

Use varies. These characters are particularly useful in epigraphical studies.

5. Are the proposed characters in current use by the user community?

Yes. Characters are present in various editions of Greek texts and used extensively by of Greek General references provided in attached bibliography.

6. After giving due considerations to the principles in *Principles and Procedures document*, must the proposed characters be entirely in the BMP?

Yes.

If YES, is a rationale provided?

Accordance with the Roadmap.

7. Should the proposed characters be kept together in a contiguous range (rather than being scattered)?

Some characters may be scattered.

8. Can any of the proposed characters be considered a presentation form of an existing character or character sequence?

Yes. Some of the characters are visually similar or identical to existing ones but semantically different.

9. Can any of the proposed characters be encoded using a composed character sequence of either existing characters or other proposed characters?

Yes. However, existing characters produce unworkable results.

10. Can any of the proposed character(s) be considered to be similar (in appearance or function) to an existing character?

Yes. See proposal

11a. Does the proposal include use of combining characters and/or use of composite sequences

Yes (combining characters).

12. Does the proposal contain characters with any special properties such as control function or similar semantics?

No.

13. Does the proposal contain any Ideographic compatibility character(s)?

No.

Proposal

This section of the proposal is divided into three subsections.

1. Alphabetic Numerals
2. Weights, Measures and Money
3. Acrophonic Numerals

1. Alphabetic Numerals – Fractions

In order to display and discuss ancient Greek mathematical works accurately, two additional characters will need to be added to the Unicode Standard, the acrophonic 1/12 and 1/8 unit.

Heath writes: "The Greeks had a preference for expressing ordinary proper fractions as the sum of two or more submultiples... The orthodox sign for a submultiple was the letter for the corresponding number (the denominator) but with an accent instead of a horizontal stroke above it; thus γ′ = ⅓ ... (γ′ is in fact short for τρίτος, so that it is used for the ordinal number 'third' as well as for the fraction ⅓, and similarly with all other accented numeral signs)… There were special signs for ½ namely ∠′ or C′, and for ⅔, namely ϑ′. When a number of submultiples are written one after the other, the sum of them is meant, and similarly when they follow a whole number; e.g. ∠′δ′ = ½ ¼ or ¾ ...; κθ ϑ′ ιγ′ λθ′ = 29 ⅔ 1/13 1/39 or 29 10/13."[1]

In the descriptions given below, the half and two-thirds characters are given without the Keraia (or the 'accent' as Heath terms it) placed after it. The use of the keraia as a numeric (as opposed to fractional sign) is late. However, in modern use these symbols are normally written with the Keraia afterwards (unless the Keraia or double Keraia[2] appear over the character as in ϵ̋ below).

2. Weights, Measures and Money

Weights and Money

In order to display and discuss ancient Greek weights and money accurately, the following characters will need to be added to the Unicode Standard.

Ancient Greeks used the same terminology and abbreviations for weights and currency. Therefore both systems are discussed together in this section. The system had many local

[1] Heath (1921:1) 41-2

[2] Ibid. 42: "A less orthodox method found in later manuscripts was to use two accents and to write e.g. ζ″ instead of ζ′ for 1/7."

variations, but the Attic-Euboic system appears to have been dominan and this is the system presented in the table below:

Scale[3]	Nominal	Post-Hippias (standard)	Unicode
6000	Talent	*c*. 25.74kg	
200	(Large) Stater	*c*. 858.00g	03A3 or 03DE
100	Mna	*c*. 429.00g	
2	(Small) Stater/ Didrachmon	*c*. 8.58g	03A3 or 03DE
1	Drachme	*c*. 4.29g	
$^1/_6$	Obol	*c*. 0.72g	

Further, as a point of interest: the table shows that the ancient Greek weight and coin system unifies both sexagesimal (1 Talent = 30 Large Staters = 60 Mnas) and decimal (1 Mna = 50 Small Staters = 100 Drachmae) systems.

Mna (often called Mina in modern usage) is usually written by stacking a small capital nu over a capital mu ($\overset{N}{M}$).

Measures of Capacity

The ancient Greeks had two systems of measurement: one for wet, and one for dry products. The *kotyle*, which is the basic measure in both wet and dry systems, is made up of six *kyathoi* or four *oxybapha*. Its value is different depending on local variations, but it is roughly $^1/_4$l.[4]

The dry measures

Scale	Nominal	Approximate weight[5]	Unicode
$^1/_6$	Kyathos	*c*.40ml	
$^1/_4$	Oxybaphon	*c*.60ml	No standard character
1	Kotyle	*c*.240ml	
4	Choinix	*c*.1l	No standard character
32	Hekteus	*c*.30l	No standard character
192	Medimnos	*c*.180l	No standard character

The liquid measures

Scale	Nominal	Approximate weight	Unicode
$^1/_6$	*Kyathos*	*c .40ml*	
$^1/_4$	*Oxybaphon*	*c. 60ml*	No standard character
1	*Kotyle*	*c. 240ml*	

[3] This table is based on that in Viedebantt (1923) 38

[4] Pryce, F.N., Lang, M.L. & Vickers, M. in OCD[3] (1996) 943

[5] For the sake of convenience, we will take the capacity 1 Kotyle= 240ml for this and the following table. This is for illustration only.

6	Hemichous	*c*. 1.5l	No standard character
12	Chous	*c*. 3l	03C7 + <superscript> 03BF
144	Metretes	*c*. 35l	

Characters for Roman Weights and Measures

Five characters are included in this sub-section. These characters are the Greek characters to represent weights (and occasionally also measures) in the Roman system. The Roman system is based on the *Libra* or *As*, of 327.45g. This is divided into 12 *Unciae*. The Greek translations for these terms are *Litra* for *Libra*, and *Ounkia*[6] for *Uncia*.

While the Greek character representing the Ounkia is settled, there are two main variants of the character for the Litra character: one based on either 039B GREEK CAPITAL LETTER LAMBDA or 03BB GREEK SMALL LETTER LAMBDA with either a slash or an iota subscript (the lambda for the l in Litra, the iota for the i); and a second which is quite distinct.

For the standard character for Keration (roughly a pint), please see Greek Vocal Notation Symbol 27 in the ancient Greek Musical section.

3. Acrophonic Numerals[7]

This is the second system of Greek numeral notation. It is currently not possible to encode the majority of these using the current Unicode Standard. It is necessary to include them to facilitate correct and accurate representation of Greek inscriptions and other sources of texts, as well as to facilitate scholarly discussion.

This system was used widely across the Greek world, with local variations, primarily in inscriptions down to Roman times. The standard—and most widely used—variation was the Athenian, which is the standard proposed here. This variant was used in all public inscriptions until the first century BC and sporadically thereafter.[8]

The characters are based on the first letters of the full words for the numbers (with the exception of the character for 1, which is a vertical stroke and 100 where an Eta is used although the word for 100 begins with an Epsilon[9]):

Number	Character	Greek Name	Transliterated Name	Notes
5	Γ	πέντε	Pente	Note this is the inscriptional form of the letter Pi

[6] Also *Onkia*. See LSJ 1268

[7] A draft proposal for Greek Acrophonic Numerals was submitted to the UTC by Bruce Robertson on July 29, 1997. As no action was taken, the Acrophonic Numerals have been included in this proposal.

[8] Heath & Toomer (1996) 1052

[9] This presumably occurs because it is easier to write letters within an eta than it is an epsilon.

10	Δ	δέκα	Deka	
100	H	ἕκατον	Hekaton	
1,000	X	χίλιοι	Chilioi	
10,000	M	μύριοι	Murioi	

The ‘half-way’ numbers 50, 500, 5,000 and 50,000 are expressed by combining Γ (5) with the other signs. So:

Number	Character
50	𐅃
500	𐅄
5,000	𐅅
50,000	𐅆

These characters are written with the higher numbers written before the lower. For example:

7 ΓII

134 HΔΔIIII

4,999 XXXX𐅄HHHH𐅅ΔΔΔΔΓIIII

To denote units of coinage or weight the same system was extended so that the first letter of the relevant weight was compiled with the acrophonic numeral. The weights involved are:

Number	Character	Greek Name	Translated Name	Notes
5	T	τάλαντον	Talent	
10	Σ	στατήρ	Stater	
100	M	μνᾶ	Mna	

So, for instance, we find 𐅂 representing 10 Talents and 𐅇 representing 500 Staters.

A single Drachma is represented by the character ⊢ and the Obol with I. All acrophonic numbers are assumed to be Drachmae unless otherwise stated. For example:

723 Drachmae 𐅄 H H Δ Δ ⊢⊢⊢

30 Talents, 2 Drachmae, 1 Obol 𐅂𐅂𐅂⊢⊢I

207 Staters 𐅒𐅒𐅏ΣΣ

20 Mnae 𐅗𐅗

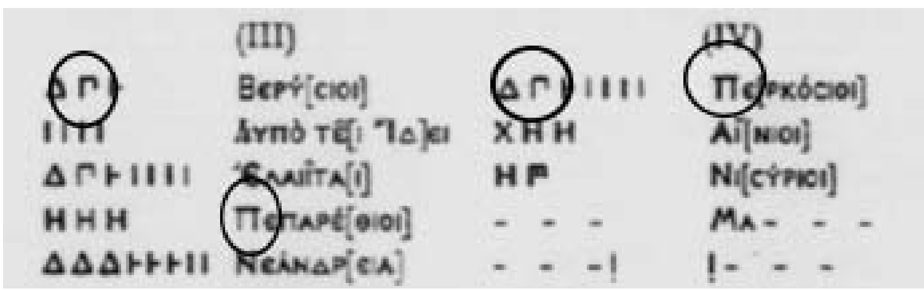
Fractions of the Unit/Obol are represented with the following characters:

Fraction	Character
1/12 Unit	/
1/8 Unit	Χ
1/4 Unit	𐅀
1/2 Unit	𐅁

For example:

1 Drachma, 3 3/4 Obols 𐅂III𐅁𐅀

It will be noted that the character used to represent 5 is 𐅃 and not Π. The form 𐅃 is identical to the form of Pi used in Greek inscriptions. This form is conventionally used when writing out Acrophonic numerals. Note that in the example below, the form 𐅃 is used for acrophonic numerals but the form Π is used for text.[10]



No sample texts are given for a few of the higher acrophonic numbers. This is because the higher numbers are rare and locating instances of them in inscriptions can be difficult. However, they are a necessary and integral part of the acrophonic numeral system.

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[10] Hiller von Gaertringen, F., *Inscriptiones Graecae I Editio Minor* (Berlin, 1924) 82

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a. Ancient Greek Numerical Characters: New Characters

Number		Name	Unicode	Comment
Alphabetic Numerals – Fractions				
1a	∠	Greek Half-Sign		2220 is identical to one glyph variant
2a	ϖ	Greek Two-Thirds Sign		
Weights, Measures and Money: Standard Greek Weights and Money				
3a	𐅷	Greek Talent Sign		22BC and 2305 are similar
4a	<	Greek Drachma Sign		22D6, 003C and 039B are similar to three of the glyph variants
5a	~	Greek Obol Sign		007E, 223D, 005C and 2013 are similar to four glyph variants
6a	≃	Greek Two Obols Sign		2248 is similar to one glyph variant
7a	⌠	Greek Three Obols Sign		0393, 03A4 and 223F are similar to three glyph variants
8a	⌡	Greek Four Obols Sign		
9a	⋐	Greek Five Obols Sign		
Weights, Measures and Money: Standard Greek Measures of Capacity				
10a	𐅹	Greek Metretes Sign		
11a	κ	Greek Kyathos Base Sign		
Weights, Measures and Money: Greek Characters for Roman Weights and Measures				
12a	𐅺	Greek Litra Sign		
13a	Γ	Greek Ounkia Sign		
14a	ξ	Greek Xestes Sign		
Weights, Measures and Money: Greek Characters for non-Graeco-Roman Measures				
15a	÷	Greek Artabe Sign		00F7 is similar to one glyph variant
Weights, Measures and Money: Ancient Greek Medical Measures				
16a	ℽ	Greek Gramma Sign		
17	𐅻	Greek Tryblion Base Sign		
Acrophonic Numerals				
18 a	ↄ	Acrophonic $^1/_4$ Unit		
19 a	ↀ	Acrophonic $^1/_2$ Unit		
20a	⊢	Acrophonic 1 Drachma		22A6 is similar
21a	⊓	Acrophonic 5 Units • Acrophonic five Drachmae		
22a	𐅼	Acrophonic 50 Units • Acrophonic 50 Drachmae		
23a	𐅽	Acrophonic 500 Units • Acrophonic 500 Drachmae		
24a	𐅾	Acrophonic 5,000 Units • Acrophonic 5,000 Drachmae		
25a	𐅿	Acrophonic 50,000 Units • Acrophonic 50,000 Drachmae • Acrophonic 5 Mnae		

26a	𐅵	Acrophonic 5 Talents		
27a	𐅶	Acrophonic 10 Talents		
28a	𐅷	Acrophonic 50 Talents		
29a	𐅸	Acrophonic 100 Talents		
30a	𐅹	Acrophonic 500 Talents		
31a	𐅺	Acrophonic 1,000 Talents		
32a	𐅻	Acrophonic 5,000 Talents		
33a	𐅼	Acrophonic 10,000 Talents		
34a	𐅽	Acrophonic 50,000 Talents		
35a	𐅾	Acrophonic 5 Staters		
36a	𐅿	Acrophonic 10 Staters		
37a	𐆀	Acrophonic 50 Staters		
38a	𐆁	Acrophonic 100 Staters		
39a	𐆂	Acrophonic 500 Staters		
40a	𐆃	Acrophonic 1,000 Staters		
41a	𐆄	Acrophonic 5,000 Staters		
42a	𐆅	Acrophonic 10,000 Staters		
43a	𐆆	Acrophonic 50,000 Staters		
44a	𐆇	Acrophonic 10 Mnae		
45a	𐆈	Acrophonic 50 Mnae		
46a	𐆉	Acrophonic 100 Mnae		
47a	𐆊	Acrophonic 500 Mnae		
48a	𐆋	Acrophonic 1,000 Mnae		
49a	𐆌	Acrophonic 5,000 Mnae		
50a	𐆍	Acrophonic 10,000 Mnae		
51a	𐆎	Acrophonic 50,000 Mnae		

b. Ancient Greek Numerical Characters: Additional Definition of Preexisting

Number		Name	Unicode	Comment
Weights, Measures and Money: Standard Greek Weights and Money				
1b	>	Greek Half Drachma Sign	003E	
Acrophonic Characters				
2b	/	Acrophonic $^{1}/_{12}$ Unit	002F	
3b	X	Acrophonic $^{1}/_{8}$ Unit • Acrophonic 1,000 Units • Acrophonic 1,000 Drachmae	03A7	
4b	I	Acrophonic 1 Unit • Acrophonic 1 Obol	0399	
5b	Δ	Acrophonic 10 Units • Acrophonic 10 Drachmae	0394	
6b	H	Acrophonic 100 Units • Acrophonic 100 Drachmae	0397	

7b	M	Acrophonic 10,000 Units • Acrophonic 10,000 Drachmae • Acrophonic 1 Mna	039C	
8b	T	Acrophonic 1 Talent	03A4	
9b	Σ	Acrophonic 1 Stater	03A3	