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TITLE: Proposal for Arabic Mathematical Alphabetic Symbols
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ACTION: For consideration by WG2
DISTRIBUTION: ISO/IEC JTC1/SC2/WG 2

This proposal is a revision of N3085, which was submitted to WG2 by Azzeddine Lazrek in 2006. The repertoire only includes characters for which evidence has been provided in N3085-1 (and/or in earlier documents[1]).

The MathML WG would very much like to see progress on this proposal since the Arabic math alphabetic are referred to in the MathML 3.0 specification due to be published this summer.

Background

Arabic mathematical expressions use special symbols and usually flow from right to left. Most of these symbols had been adopted through official international conventions such as *The Amman's 1987 convention* (see figure 2, page 21 in N3085-1).

Arabic mathematical alphabetic symbols constitute a widely used version of the Arabic alphabet, used over many centuries and in many contexts, e.g., in manuscripts, books on epigraphy, manuals, and traditional print editions. This way of writing expressions corresponds to the standards and conventions adopted in languages using Arabic alphabet-based scripts, such as Arabic or Persian. The majority of mathematics handbooks used in the Middle East, Libya, Algeria, etc. are typeset according to these conventions.

In some cases, both Latin and Arabic types of presentations of mathematics may be required in the same text. Therefore, the addition of those characters is necessary for the correct and accurate representation of ancient and current Arabic mathematical expressions.

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[1] Earlier versions of the Arabic Mathematical Alphabetic Symbols proposal are listed and posted at: http://www.ucam.ac.ma/fssm/rydarab/unicode.htm. The earlier versions may have slightly different repertoires and examples. Also see: http://www.ucam.ac.ma/fssm/rydarab/doc/unicode/samples.pdf

Style Variations in Math
In mathematics, style variations are very important semantically. Mathematical alphabetic symbols in Latin-based script texts are typeset in a different way from letters in ordinary text, and may appear, at first glance, to be a font variation. Compare the letter H, which can appear as in a given document as a plain H, a bold H (**H**), an italic H (*H*), or a script H (ℋ). However, these characters have distinct and usually unrelated mathematical semantics: the normal H represents a different variable from the bold H (**H**). Losing these attributes in plain text would result in distinctions being lost, and the meaning of the text being altered.[2] In the same way, Arabic styles – the tailed, stretched, looped, or double-struck forms – have semantic content that needs to be kept in plain text, and not handled at the font level.

Arabic Math Symbols vs. Arabic Presentation Forms-B and Arabic block characters
With minor variations in shape, certain forms of the Arabic characters already exist in the Unicode Standard/ISO 10646. In particular, the isolated and initial styles of the Arabic letters appear in the Arabic Presentation Forms-B block. Because the Arabic Presentation forms were included for compatibility, the use of these characters for math could cause problems with existing systems. In our opinion, it is cleaner to have math variables separate from legacy presentation forms.

Characters in the 0627..064A block are subject to shaping, whereas Arabic math alphabetic are not. While one could be handle certain Arabic mathematical symbols as characters from the 0627..064A block with U+200C ZERO WIDTH NON-JOINER, we think it makes better sense to encode a separate set of Arabic math symbols. Such a set will also facilitate the use of MathML for Arabic mathematical presentation.

Arabic Trigonometric Function Names
For right-to-left Arabic mathematical text, the usual shaping, or ligaturing, of Arabic letters is omitted except for abbreviations or for entities like trigonometric function names. Trigonometric names need to be shaped and can be handled as characters in the 0627..064A block, just as ASCII letters are used for trigonometric functions in Western mathematics. The two characters at 1EEF0 and 1EEF1 are operators that stretch, and hence are separately encoded here.

Order of Characters
There are two orders of characters in Arabic, one used in mathematics or alphabetic numeration (a, b, j, d, …), and the second which is typically found in dictionaries (a, b, t, th, …). The mathematical order is the older, generic Semitic order. In this proposal, the abjad order is

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[2] See further section 2.2 of Unicode Technical Report #25 Unicode Support for Mathematics by Barbara Beeton, Asmus Freytag, and Murray Sargent, 2008, http://www.unicode.org/tr25/.

followed. Typically, linguistic sorting is not used with mathematical expressions, so the use of the abjad order for math should not present a problem. On the other hand, requiring math implementations to use the a, b, t, th, the order would be problematic for math sorting. (However, sorting can be tailored if desired.)

Input
Differentiating the Arabic mathematical isolated symbols from 0627..064A is straightforward: the latter are translated to the former by default. If characters are input as ordinary text, i.e., inside quotes, they end up in the 0627..064A block, and will be subject to shaping.[3]

Code chart and Names list
Holes in the columns running from 1EE00 to 1EEBF are left open for the addition of more characters, as evidence is provided. Three columns from 1EEC0..1EEEF are also left for additional characters, as needed. The last column, 1EEF0..1EEFF is for operators and similar symbols.

The names list cross-references Arabic Presentation forms.

Character Properties
The alphabetic characters have been assigned the general category of Lo, reflecting the general category of Latin and Greek alphanumeric math symbols.

The characters should also have the "Other_Math" property.

Decomposition
Decompositions are provided for the characters in the range 1EE00-1EEBB. The <font> label reflects the way Latin and Greek alphanumeric math symbols are decomposed.

Character Properties List
1EE00;ARABIC MATHEMATICAL ALEF;Lo;0;AL;<font> 0627;;;;N;;;;;
1EE01;ARABIC MATHEMATICAL BEH;Lo;0;AL;<font> 0628;;;;N;;;;;
1EE02;ARABIC MATHEMATICAL JEEM;Lo;0;AL;<font> 062C;;;;N;;;;;
1EE03;ARABIC MATHEMATICAL DAL;Lo;0;AL;<font> 062F;;;;N;;;;;
1EE05;ARABIC MATHEMATICAL WAW;Lo;0;AL;<font> 0648;;;;N;;;;;
1EE06;ARABIC MATHEMATICAL ZAIN;Lo;0;AL;<font> 0632;;;;N;;;;;
1EE07;ARABIC MATHEMATICAL HAH;Lo;0;AL;<font> 062D;;;;N;;;;;
1EE08;ARABIC MATHEMATICAL TAH;Lo;0;AL;<font> 0637;;;;N;;;;;
1EE09;ARABIC MATHEMATICAL YEH;Lo;0;AL;<font> 064A;;;;N;;;;;
1EE0A;ARABIC MATHEMATICAL KAF;Lo;0;AL;<font> 0643;;;;N;;;;;
1EE0B;ARABIC MATHEMATICAL LAM;Lo;0;AL;<font> 0644;;;;N;;;;;

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[3] See section 4.1 of Unicode Technical Note #28 "Unicode Nearly Plain-Text Encoding of Mathematics" by Murray Sargent, http://www.unicode.org/notes/tn28/.

1EE0C;ARABIC MATHEMATICAL MEEM;Lo;0;AL;<font> 0645;;;;N;;;;;
1EE0D;ARABIC MATHEMATICAL NOON;Lo;0;AL;<font> 0646;;;;N;;;;;
1EE0E;ARABIC MATHEMATICAL SEEN;Lo;0;AL;<font> 0633;;;;N;;;;;
1EE0F;ARABIC MATHEMATICAL AIN;Lo;0;AL;<font> 0639;;;;N;;;;;
1EE10;ARABIC MATHEMATICAL FEH;Lo;0;AL;<font> 0641;;;;N;;;;;
1EE11;ARABIC MATHEMATICAL SAD;Lo;0;AL;<font> 0635;;;;N;;;;;
1EE12;ARABIC MATHEMATICAL QAF;Lo;0;AL;<font> 0642;;;;N;;;;;
1EE13;ARABIC MATHEMATICAL REH;Lo;0;AL;<font> 0631;;;;N;;;;;
1EE14;ARABIC MATHEMATICAL SHEEN;Lo;0;AL;<font> 0634;;;;N;;;;;
1EE15;ARABIC MATHEMATICAL TEH;Lo;0;AL;<font> 062A;;;;N;;;;;
1EE16;ARABIC MATHEMATICAL THEH;Lo;0;AL;<font> 062B;;;;N;;;;;
1EE17;ARABIC MATHEMATICAL KHAH;Lo;0;AL;<font> 062E;;;;N;;;;;
1EE18;ARABIC MATHEMATICAL THAL;Lo;0;AL;<font> 0630;;;;N;;;;;
1EE19;ARABIC MATHEMATICAL DAD;Lo;0;AL;<font> 0636;;;;N;;;;;
1EE1A;ARABIC MATHEMATICAL ZAH;Lo;0;AL;<font> 0638;;;;N;;;;;
1EE1B;ARABIC MATHEMATICAL GHAIN;Lo;0;AL;<font> 063A;;;;N;;;;;
1EE1C;ARABIC MATHEMATICAL DOTLESS BEH;Lo;0;AL;<font> 066E;;;;N;;;;;
1EE1D;ARABIC MATHEMATICAL DOTLESS NOON;Lo;0;AL;<font> 06BA;;;;N;;;;;
1EE1E;ARABIC MATHEMATICAL DOTLESS FEH;Lo;0;AL;<font> 06A1;;;;N;;;;;
1EE1F;ARABIC MATHEMATICAL DOTLESS QAF;Lo;0;AL;<font> 066F;;;;N;;;;;
1EE21;ARABIC MATHEMATICAL INITIAL BEH;Lo;0;AL;<font> 0628;;;;N;;;;;
1EE22;ARABIC MATHEMATICAL INITIAL JEEM;Lo;0;AL;<font> 062C;;;;N;;;;;
1EE24;ARABIC MATHEMATICAL INITIAL HEH;Lo;0;AL;<font> 0647;;;;N;;;;;
1EE27;ARABIC MATHEMATICAL INITIAL HAH;Lo;0;AL;<font> 062D;;;;N;;;;;
1EE29;ARABIC MATHEMATICAL INITIAL YEH;Lo;0;AL;<font> 064A;;;;N;;;;;
1EE2A;ARABIC MATHEMATICAL INITIAL KAF;Lo;0;AL;<font> 0643;;;;N;;;;;
1EE2B;ARABIC MATHEMATICAL INITIAL LAM;Lo;0;AL;<font> 0644;;;;N;;;;;
1EE2C;ARABIC MATHEMATICAL INITIAL MEEM;Lo;0;AL;<font> 0645;;;;N;;;;;
1EE2D;ARABIC MATHEMATICAL INITIAL NOON;Lo;0;AL;<font> 0646;;;;N;;;;;
1EE2E;ARABIC MATHEMATICAL INITIAL SEEN;Lo;0;AL;<font> 0633;;;;N;;;;;
1EE2F;ARABIC MATHEMATICAL INITIAL AIN;Lo;0;AL;<font> 0639;;;;N;;;;;
1EE30;ARABIC MATHEMATICAL INITIAL FEH;Lo;0;AL;<font> 0641;;;;N;;;;;
1EE31;ARABIC MATHEMATICAL INITIAL SAD;Lo;0;AL;<font> 0635;;;;N;;;;;
1EE32;ARABIC MATHEMATICAL INITIAL QAF;Lo;0;AL;<font> 0642;;;;N;;;;;
1EE34;ARABIC MATHEMATICAL INITIAL SHEEN;Lo;0;AL;<font> 0634;;;;N;;;;;
1EE35;ARABIC MATHEMATICAL INITIAL TEH;Lo;0;AL;<font> 062A;;;;N;;;;;
1EE36;ARABIC MATHEMATICAL INITIAL THEH;Lo;0;AL;<font> 062B;;;;N;;;;;
1EE37;ARABIC MATHEMATICAL INITIAL KHAH;Lo;0;AL;<font> 062E;;;;N;;;;;
1EE39;ARABIC MATHEMATICAL INITIAL DAD;Lo;0;AL;<font> 0636;;;;N;;;;;
1EE3B;ARABIC MATHEMATICAL INITIAL GHAIN;Lo;0;AL;<font> 063A;;;;N;;;;;
1EE42;ARABIC MATHEMATICAL TAILED JEEM;Lo;0;AL;<font> 062C;;;;N;;;;;
1EE47;ARABIC MATHEMATICAL TAILED HAH;Lo;0;AL;<font> 062D;;;;N;;;;;
1EE49;ARABIC MATHEMATICAL TAILED YEH;Lo;0;AL;<font> 064A;;;;N;;;;;

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1EE4B;ARABIC MATHEMATICAL TAILED LAM;Lo;0;AL;<font> 0644;;;;N;;;;;
1EE4D;ARABIC MATHEMATICAL TAILED NOON;Lo;0;AL;<font> 0646;;;;N;;;;;
1EE4E;ARABIC MATHEMATICAL TAILED SEEN;Lo;0;AL;<font> 0633;;;;N;;;;;
1EE4F;ARABIC MATHEMATICAL TAILED AIN;Lo;0;AL;<font> 0639;;;;N;;;;;
1EE51;ARABIC MATHEMATICAL TAILED SAD;Lo;0;AL;<font> 0635;;;;N;;;;;
1EE52;ARABIC MATHEMATICAL TAILED QAF;Lo;0;AL;<font> 0642;;;;N;;;;;
1EE54;ARABIC MATHEMATICAL TAILED SHEEN;Lo;0;AL;<font> 0634;;;;N;;;;;
1EE57;ARABIC MATHEMATICAL TAILED KHAH;Lo;0;AL;<font> 062E;;;;N;;;;;
1EE59;ARABIC MATHEMATICAL TAILED DAD;Lo;0;AL;<font> 0636;;;;N;;;;;
1EE5B;ARABIC MATHEMATICAL TAILED GHAIN;Lo;0;AL;<font> 063A;;;;N;;;;;
1EE5D;ARABIC MATHEMATICAL TAILED DOTLESS NOON;Lo;0;AL;<font> 06BA;;;;N;;;;;
1EE5F;ARABIC MATHEMATICAL TAILED DOTLESS QAF;Lo;0;AL;<font> 066F;;;;N;;;;;
1EE61;ARABIC MATHEMATICAL STRETCHED BEH;Lo;0;AL;<font> 0628;;;;N;;;;;
1EE62;ARABIC MATHEMATICAL STRETCHED JEEM;Lo;0;AL;<font> 062C;;;;N;;;;;
1EE64;ARABIC MATHEMATICAL STRETCHED HEH;Lo;0;AL;<font> 0647;;;;N;;;;;
1EE67;ARABIC MATHEMATICAL STRETCHED HAH;Lo;0;AL;<font> 062D;;;;N;;;;;
1EE68;ARABIC MATHEMATICAL STRETCHED TAH;Lo;0;AL;<font> 0637;;;;N;;;;;
1EE69;ARABIC MATHEMATICAL STRETCHED YEH;Lo;0;AL;<font> 064A;;;;N;;;;;
1EE6A;ARABIC MATHEMATICAL STRETCHED KAF;Lo;0;AL;<font> 0643;;;;N;;;;;
1EE6C;ARABIC MATHEMATICAL STRETCHED MEEM;Lo;0;AL;<font> 0645;;;;N;;;;;
1EE6D;ARABIC MATHEMATICAL STRETCHED NOON;Lo;0;AL;<font> 0646;;;;N;;;;;
1EE6E;ARABIC MATHEMATICAL STRETCHED SEEN;Lo;0;AL;<font> 0633;;;;N;;;;;
1EE6F;ARABIC MATHEMATICAL STRETCHED AIN;Lo;0;AL;<font> 0639;;;;N;;;;;
1EE70;ARABIC MATHEMATICAL STRETCHED FEH;Lo;0;AL;<font> 0641;;;;N;;;;;
1EE71;ARABIC MATHEMATICAL STRETCHED SAD;Lo;0;AL;<font> 0635;;;;N;;;;;
1EE72;ARABIC MATHEMATICAL STRETCHED QAF;Lo;0;AL;<font> 0642;;;;N;;;;;
1EE74;ARABIC MATHEMATICAL STRETCHED SHEEN;Lo;0;AL;<font> 0634;;;;N;;;;;
1EE75;ARABIC MATHEMATICAL STRETCHED TEH;Lo;0;AL;<font> 062A;;;;N;;;;;
1EE76;ARABIC MATHEMATICAL STRETCHED THEH;Lo;0;AL;<font> 062B;;;;N;;;;;
1EE77;ARABIC MATHEMATICAL STRETCHED KHAH;Lo;0;AL;<font> 062E;;;;N;;;;;
1EE79;ARABIC MATHEMATICAL STRETCHED DAD;Lo;0;AL;<font> 0636;;;;N;;;;;
1EE7A;ARABIC MATHEMATICAL STRETCHED ZAH;Lo;0;AL;<font> 0638;;;;N;;;;;
1EE7B;ARABIC MATHEMATICAL STRETCHED GHAIN;Lo;0;AL;<font> 063A;;;;N;;;;;
1EE7C;ARABIC MATHEMATICAL STRECHED DOTLESS BEH;Lo;0;AL;<font> 066E;;;;N;;;;;
1EE7E;ARABIC MATHEMATICAL STRECHED DOTLESS FEH;Lo;0;AL;<font> 06A1;;;;N;;;;;
1EE80;ARABIC MATHEMATICAL LOOPED ALEF;Lo;0;AL;<font> 0627;;;;N;;;;;
1EE81;ARABIC MATHEMATICAL LOOPED BEH;Lo;0;AL;<font> 0628;;;;N;;;;;
1EE82;ARABIC MATHEMATICAL LOOPED JEEM;Lo;0;AL;<font> 062C;;;;N;;;;;
1EE83;ARABIC MATHEMATICAL LOOPED DAL;Lo;0;AL;<font> 062F;;;;N;;;;;
1EE84;ARABIC MATHEMATICAL LOOPED HEH;Lo;0;AL;<font> 0647;;;;N;;;;;
1EE85;ARABIC MATHEMATICAL LOOPED WAW;Lo;0;AL;<font> 0648;;;;N;;;;;
1EE86;ARABIC MATHEMATICAL LOOPED ZAIN;Lo;0;AL;<font> 0632;;;;N;;;;;
1EE87;ARABIC MATHEMATICAL LOOPED HAH;Lo;0;AL;<font> 062D;;;;N;;;;;
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1EE88;ARABIC MATHEMATICAL LOOPED TAH;Lo;0;AL;<font> 0637;;;;N;;;;;
1EE89;ARABIC MATHEMATICAL LOOPED YEH;Lo;0;AL;<font> 064A;;;;N;;;;;
1EE8B;ARABIC MATHEMATICAL LOOPED LAM;Lo;0;AL;<font> 0644;;;;N;;;;;
1EE8C;ARABIC MATHEMATICAL LOOPED MEEM;Lo;0;AL;<font> 0645;;;;N;;;;;
1EE8D;ARABIC MATHEMATICAL LOOPED NOON;Lo;0;AL;<font> 0646;;;;N;;;;;
1EE8E;ARABIC MATHEMATICAL LOOPED SEEN;Lo;0;AL;<font> 0633;;;;N;;;;;
1EE8F;ARABIC MATHEMATICAL LOOPED AIN;Lo;0;AL;<font> 0639;;;;N;;;;;
1EE90;ARABIC MATHEMATICAL LOOPED FEH;Lo;0;AL;<font> 0641;;;;N;;;;;
1EE91;ARABIC MATHEMATICAL LOOPED SAD;Lo;0;AL;<font> 0635;;;;N;;;;;
1EE92;ARABIC MATHEMATICAL LOOPED QAF;Lo;0;AL;<font> 0642;;;;N;;;;;
1EE93;ARABIC MATHEMATICAL LOOPED REH;Lo;0;AL;<font> 0631;;;;N;;;;;
1EE94;ARABIC MATHEMATICAL LOOPED SHEEN;Lo;0;AL;<font> 0634;;;;N;;;;;
1EE95;ARABIC MATHEMATICAL LOOPED TEH;Lo;0;AL;<font> 062A;;;;N;;;;;
1EE96;ARABIC MATHEMATICAL LOOPED THEH;Lo;0;AL;<font> 062B;;;;N;;;;;
1EE97;ARABIC MATHEMATICAL LOOPED KHAH;Lo;0;AL;<font> 062E;;;;N;;;;;
1EE98;ARABIC MATHEMATICAL LOOPED THAL;Lo;0;AL;<font> 0630;;;;N;;;;;
1EE99;ARABIC MATHEMATICAL LOOPED DAD;Lo;0;AL;<font> 0636;;;;N;;;;;
1EE9A;ARABIC MATHEMATICAL LOOPED ZAH;Lo;0;AL;<font> 0638;;;;N;;;;;
1EE9B;ARABIC MATHEMATICAL LOOPED GHAIN;Lo;0;AL;<font> 063A;;;;N;;;;;
1EEA1;ARABIC MATHEMATICAL DOUBLE-STRUCK BEH;Lo;0;AL;<font> 0628;;;;N;;;;;
1EEA2;ARABIC MATHEMATICAL DOUBLE-STRUCK JEEM;Lo;0;AL;<font> 062C;;;;N;;;;;
1EEA3;ARABIC MATHEMATICAL DOUBLE-STRUCK DAL;Lo;0;AL;<font> 062F;;;;N;;;;;
1EEA5;ARABIC MATHEMATICAL DOUBLE-STRUCK WAW;Lo;0;AL;<font> 0648;;;;N;;;;;
1EEA6;ARABIC MATHEMATICAL DOUBLE-STRUCK ZAIN;Lo;0;AL;<font> 0632;;;;N;;;;;
1EEA7;ARABIC MATHEMATICAL DOUBLE-STRUCK HAH;Lo;0;AL;<font> 062D;;;;N;;;;;
1EEA8;ARABIC MATHEMATICAL DOUBLE-STRUCK TAH;Lo;0;AL;<font> 0637;;;;N;;;;;
1EEA9;ARABIC MATHEMATICAL DOUBLE-STRUCK YEH;Lo;0;AL;<font> 064A;;;;N;;;;;
1EEAB;ARABIC MATHEMATICAL DOUBLE-STRUCK LAM;Lo;0;AL;<font> 0644;;;;N;;;;;
1EEAC;ARABIC MATHEMATICAL DOUBLE-STRUCK MEEM;Lo;0;AL;<font> 0645;;;;N;;;;;
1EEAD;ARABIC MATHEMATICAL DOUBLE-STRUCK NOON;Lo;0;AL;<font> 0646;;;;N;;;;;
1EEAE;ARABIC MATHEMATICAL DOUBLE-STRUCK SEEN;Lo;0;AL;<font> 0633;;;;N;;;;;
1EEAF;ARABIC MATHEMATICAL DOUBLE-STRUCK AIN;Lo;0;AL;<font> 0639;;;;N;;;;;
1EEB0;ARABIC MATHEMATICAL DOUBLE-STRUCK FEH;Lo;0;AL;<font> 0641;;;;N;;;;;
1EEB1;ARABIC MATHEMATICAL DOUBLE-STRUCK SAD;Lo;0;AL;<font> 0635;;;;N;;;;;
1EEB2;ARABIC MATHEMATICAL DOUBLE-STRUCK QAF;Lo;0;AL;<font> 0642;;;;N;;;;;
1EEB3;ARABIC MATHEMATICAL DOUBLE-STRUCK REH;Lo;0;AL;<font> 0631;;;;N;;;;;
1EEB4;ARABIC MATHEMATICAL DOUBLE-STRUCK SHEEN;Lo;0;AL;<font> 0634;;;;N;;;;;
1EEB5;ARABIC MATHEMATICAL DOUBLE-STRUCK TEH;Lo;0;AL;<font> 062A;;;;N;;;;;
1EEB6;ARABIC MATHEMATICAL DOUBLE-STRUCK THEH;Lo;0;AL;<font> 062B;;;;N;;;;;
1EEB7;ARABIC MATHEMATICAL DOUBLE-STRUCK KHAH;Lo;0;AL;<font> 062E;;;;N;;;;;
1EEB8;ARABIC MATHEMATICAL DOUBLE-STRUCK THAL;Lo;0;AL;<font> 0630;;;;N;;;;;
1EEB9;ARABIC MATHEMATICAL DOUBLE-STRUCK DAD;Lo;0;AL;<font> 0636;;;;N;;;;;
1EEBA;ARABIC MATHEMATICAL DOUBLE-STRUCK ZAH;Lo;0;AL;<font> 0638;;;;N;;;;;

1EEBB;ARABIC MATHEMATICAL DOUBLE-STRUCK GHAIN;Lo;0;AL;<font> 063A;;;;N;;;;;
1EEF0;ARABIC MATHEMATICAL OPERATOR MEEM WITH HAH WITH
TATWEEL;Sm;0;ON;;;;;N;;;;;
1EEF1;ARABIC MATHEMATICAL OPERATOR HAH WITH DAL;Sm;0;ON;;;;;N;;;;;

	1EE0	1EE1	1EE2	1EE3	1EE4	1EE5	1EE6	1EE7	1EE8	1EE9	1EEA	1EEB	1EEC	1EED	1EEE	1EEF
0	ا 1EE00	ف 1EE10		ف 1EE30				فا 1EE70	ه 1EE80	فـ 1EE90		ف 1EEB0				محـ 1EEF0
1	ب 1EE01	ص 1EE11	ب 1EE21	ص 1EE31		ص 1EE51	با 1EE61	صا 1EE71	ب 1EE81	ص 1EE91	ب 1EEA1	ص 1EEB1				حد 1EEF1
2	ج 1EE02	ق 1EE12	ج 1EE22	ق 1EE32	ج 1EE42	ق 1EE52	جا 1EE62	قا 1EE72	ج 1EE82	ق 1EE92	ج 1EEA2	ق 1EEB2				
3	د 1EE03	ر 1EE13							د 1EE83	د 1EE93	د 1EEA3	ر 1EEB3				
4		ش 1EE14	ه 1EE24	ش 1EE34		ش 1EE54	ها 1EE64	شا 1EE74	ه 1EE84	ش 1EE94		ش 1EEB4				
5	و 1EE05	ت 1EE15		ت 1EE35				تا 1EE75	و 1EE85	ت 1EE95	و 1EEA5	ت 1EEB5				
6	ز 1EE06	ث 1EE16		ث 1EE36				ثا 1EE76	ن 1EE86	ث 1EE96	ز 1EEA6	ث 1EEB6				
7	ح 1EE07	خ 1EE17	ح 1EE27	خ 1EE37	ح 1EE47	خ 1EE57	حا 1EE67	خا 1EE77	ح 1EE87	خ 1EE97	ح 1EEA7	خ 1EEB7				
8	ط 1EE08	ذ 1EE18					طا 1EE68		ط 1EE88	ذ 1EE98	ط 1EEA8	ذ 1EEB8				
9	ي 1EE09	ض 1EE19	ي 1EE29	ض 1EE39	ي 1EE49	ض 1EE59	يا 1EE69	ضا 1EE79	ي 1EE89	ض 1EE99	ي 1EEA9	ض 1EEB9				
A	ك 1EE0A	ظ 1EE1A	ك 1EE2A				كا 1EE6A	ظا 1EE7A	ظ 1EE8A		ظ 1EEBA					
B	ل 1EE0B	غ 1EE1B	ل 1EE2B	غ 1EE3B	ل 1EE4B	غ 1EE5B		غا 1EE7B	ل 1EE8B	غ 1EE9B	ل 1EEAB	غ 1EEBB				
C	م 1EE0C	ب 1EE1C	م 1EE2C				ما 1EE6C	با 1EE7C	م 1EE8C		م 1EEAC					
D	ن 1EE0D	ل 1EE1D	ن 1EE2D		ن 1EE4D	ن 1EE5D	نا 1EE6D		ن 1EE8D		ن 1EEAD					
E	س 1EE0E	ف 1EE1E	س 1EE2E		س 1EE4E		سا 1EE6E	فا 1EE7E	س 1EE8E		س 1EEAE					
F	ع 1EE0F	و 1EE1F	ع 1EE2F		ع 1EE4F	ه 1EE5F	عا 1EE6F		ع 1EE8F		ع 1EEAF					

Isolated symbols

1EE00 ا ARABIC MATHEMATICAL ALEF
→ FE8D ا arabic letter alef isolated form
1EE01 ب ARABIC MATHEMATICAL BEH
→ FE8F ب arabic letter beh isolated form
1EE02 ج ARABIC MATHEMATICAL JEEM
→ FE9D ج arabic letter jeem isolated form
1EE03 د ARABIC MATHEMATICAL DAL
→ FEA9 د arabic letter dal isolated form
1EE04   <reserved>
1EE05 و ARABIC MATHEMATICAL WAW
→ FEED و arabic letter waw isolated form
1EE06 ز ARABIC MATHEMATICAL ZAIN
→ FEAF ز arabic letter zain isolated form
1EE07 ح ARABIC MATHEMATICAL HAH
→ FEA1 ح arabic letter hah isolated form
1EE08 ط ARABIC MATHEMATICAL TAH
→ FEC1 ط arabic letter tah isolated form
1EE09 ي ARABIC MATHEMATICAL YEH
→ FEF1 ي arabic letter yeh isolated form
1EE0A ك ARABIC MATHEMATICAL KAF
→ FED9 ك arabic letter kaf isolated form
1EE0B ل ARABIC MATHEMATICAL LAM
→ FEDD ل arabic letter lam isolated form
1EE0C م ARABIC MATHEMATICAL MEEM
→ FEE1 م arabic letter meem isolated form
1EE0D ن ARABIC MATHEMATICAL NOON
→ FEE5 ن arabic letter noon isolated form
1EE0E س ARABIC MATHEMATICAL SEEN
→ FEB1 س arabic letter seen isolated form
1EE0F ع ARABIC MATHEMATICAL AIN
→ FEC9 ع arabic letter ain isolated form
1EE10 ف ARABIC MATHEMATICAL FEH
→ FED1 ف arabic letter feh isolated form
1EE11 ص ARABIC MATHEMATICAL SAD
→ FEB9 ص arabic letter sad isolated form
1EE12 ق ARABIC MATHEMATICAL QAF
→ FED5 ق arabic letter qaf isolated form
1EE13 ر ARABIC MATHEMATICAL REH
→ FEAD ر arabic letter reh isolated form
1EE14 ش ARABIC MATHEMATICAL SHEEN
→ FEB5 ش arabic letter sheen isolated form
1EE15 ت ARABIC MATHEMATICAL TEH
→ FE95 ت arabic letter teh isolated form
1EE16 ث ARABIC MATHEMATICAL THEH
→ FE99 ث arabic letter theh isolated form
1EE17 خ ARABIC MATHEMATICAL KHAH
→ FEA5 خ arabic letter khah isolated form
1EE18 ذ ARABIC MATHEMATICAL THAL
→ FEAB ذ arabic letter thal isolated form
1EE19 ض ARABIC MATHEMATICAL DAD
→ FEBD ض arabic letter dad isolated form
1EE1A ظ ARABIC MATHEMATICAL ZAH
→ FEC5 ظ arabic letter zah isolated form
1EE1B غ ARABIC MATHEMATICAL GHAIN
→ FECD غ arabic letter ghain isolated form
1EE1C ٮ ARABIC MATHEMATICAL DOTLESS BEH
→ 066E ٮ arabic letter dotless beh
1EE1D ں ARABIC MATHEMATICAL DOTLESS NOON
→ 06BA ں arabic letter noon ghunna
1EE1E ڡ ARABIC MATHEMATICAL DOTLESS FEH
→ 06A1 ڡ arabic letter dotless feh
1EE1F ٯ ARABIC MATHEMATICAL DOTLESS QAF
→ 066F ٯ arabic letter dotless qaf

Initial symbols

1EE21 ب ARABIC MATHEMATICAL INITIAL BEH
→ FE91 ب arabic letter beh initial form
1EE22 ج ARABIC MATHEMATICAL INITIAL JEEM
→ FE9F ج arabic letter jeem initial form
1EE23   <reserved>
1EE24 ه ARABIC MATHEMATICAL INITIAL HEH
→ FEEB ه arabic letter heh initial form
1EE25   <reserved>
1EE26   <reserved>
1EE27 ح ARABIC MATHEMATICAL INITIAL HAH
→ FEA3 ح arabic letter hah initial form
1EE28   <reserved>
1EE29 ي ARABIC MATHEMATICAL INITIAL YEH
→ FEF3 ي arabic letter yeh initial form
1EE2A ک ARABIC MATHEMATICAL INITIAL KAF
→ FEDB ک arabic letter kaf initial form
1EE2B ل ARABIC MATHEMATICAL INITIAL LAM
→ FEDF ل arabic letter lam initial form
1EE2C م ARABIC MATHEMATICAL INITIAL MEEM
→ FEE3 م arabic letter meem initial form
1EE2D ن ARABIC MATHEMATICAL INITIAL NOON
→ FEE7 ن arabic letter noon initial form
1EE2E س ARABIC MATHEMATICAL INITIAL SEEN
→ FEB3 س arabic letter seen initial form
1EE2F ع ARABIC MATHEMATICAL INITIAL AIN
→ FECB ع arabic letter ain initial form
1EE30 ف ARABIC MATHEMATICAL INITIAL FEH
→ FED3 ف arabic letter feh initial form
1EE31 ص ARABIC MATHEMATICAL INITIAL SAD
→ FEBB ص arabic letter sad initial form
1EE32 ق ARABIC MATHEMATICAL INITIAL QAF
→ FED7 ق arabic letter qaf initial form
1EE33   <reserved>
1EE34 ش ARABIC MATHEMATICAL INITIAL SHEEN
→ FEB7 ش arabic letter sheen initial form
1EE35 ت ARABIC MATHEMATICAL INITIAL TEH
→ FE97 ت arabic letter teh initial form
1EE36 ث ARABIC MATHEMATICAL INITIAL THEH
→ FE9B ث arabic letter theh initial form
1EE37 خ ARABIC MATHEMATICAL INITIAL KHAH
→ FEA7 خ arabic letter khah initial form
1EE38   <reserved>
1EE39 ض ARABIC MATHEMATICAL INITIAL DAD
→ FEBF ض arabic letter dad initial form
1EE3A   <reserved>
1EE3B غ ARABIC MATHEMATICAL INITIAL GHAIN
→ FECF غ arabic letter ghain initial form

Tailed symbols

1EE42 ج ARABIC MATHEMATICAL TAILED JEEM
1EE43   <reserved>
1EE44   <reserved>
1EE45   <reserved>
1EE46   <reserved>
1EE47 ح ARABIC MATHEMATICAL TAILED HAH
1EE48   <reserved>
1EE49 ي ARABIC MATHEMATICAL TAILED YEH
1EE4A   <reserved>
1EE4B ل ARABIC MATHEMATICAL TAILED LAM
1EE4C   <reserved>
1EE4D ن ARABIC MATHEMATICAL TAILED NOON
1EE4E س ARABIC MATHEMATICAL TAILED SEEN
1EE4F ع ARABIC MATHEMATICAL TAILED AIN
1EE50   <reserved>
1EE51 ص ARABIC MATHEMATICAL TAILED SAD
1EE52 ق ARABIC MATHEMATICAL TAILED QAF

1EE53		\<reserved\>
1EE54	ش	ARABIC MATHEMATICAL TAILED SHEEN
1EE55		\<reserved\>
1EE56		\<reserved\>
1EE57	خ	ARABIC MATHEMATICAL TAILED KHAH
1EE58		\<reserved\>
1EE59	ض	ARABIC MATHEMATICAL TAILED DAD
1EE5A		\<reserved\>
1EE5B	غ	ARABIC MATHEMATICAL TAILED GHAIN
1EE5C		\<reserved\>
1EE5D	ں	ARABIC MATHEMATICAL TAILED DOTLESS NOON
1EE5E		\<reserved\>
1EE5F	ى	ARABIC MATHEMATICAL TAILED DOTLESS QAF

Stretched symbols

1EE61	بـ	ARABIC MATHEMATICAL STRETCHED BEH
1EE62	جـ	ARABIC MATHEMATICAL STRETCHED JEEM
1EE63		\<reserved\>
1EE64	هـ	ARABIC MATHEMATICAL STRETCHED HEH
1EE65		\<reserved\>
1EE66		\<reserved\>
1EE67	حـ	ARABIC MATHEMATICAL STRETCHED HAH
1EE68	طـ	ARABIC MATHEMATICAL STRETCHED TAH
1EE69	يـ	ARABIC MATHEMATICAL STRETCHED YEH
1EE6A	كـ	ARABIC MATHEMATICAL STRETCHED KAF
1EE6B		\<reserved\>
1EE6C	مـ	ARABIC MATHEMATICAL STRETCHED MEEM
1EE6D	نـ	ARABIC MATHEMATICAL STRETCHED NOON
1EE6E	سـ	ARABIC MATHEMATICAL STRETCHED SEEN
1EE6F	عـ	ARABIC MATHEMATICAL STRETCHED AIN
1EE70	فـ	ARABIC MATHEMATICAL STRETCHED FEH
1EE71	صـ	ARABIC MATHEMATICAL STRETCHED SAD
1EE72	قـ	ARABIC MATHEMATICAL STRETCHED QAF
1EE73		\<reserved\>
1EE74	شـ	ARABIC MATHEMATICAL STRETCHED SHEEN
1EE75	تـ	ARABIC MATHEMATICAL STRETCHED TEH
1EE76	ثـ	ARABIC MATHEMATICAL STRETCHED THEH
1EE77	خـ	ARABIC MATHEMATICAL STRETCHED KHAH
1EE78		\<reserved\>
1EE79	ضـ	ARABIC MATHEMATICAL STRETCHED DAD
1EE7A	ظـ	ARABIC MATHEMATICAL STRETCHED ZAH
1EE7B	غـ	ARABIC MATHEMATICAL STRETCHED GHAIN
1EE7C	ٮـ	ARABIC MATHEMATICAL STRECHED DOTLESS BEH
1EE7D		\<reserved\>
1EE7E	ڡـ	ARABIC MATHEMATICAL STRECHED DOTLESS FEH

Looped symbols

1EE80	ا	ARABIC MATHEMATICAL LOOPED ALEF
1EE81	ٮ	ARABIC MATHEMATICAL LOOPED BEH
1EE82	ح	ARABIC MATHEMATICAL LOOPED JEEM
1EE83	ﺪ	ARABIC MATHEMATICAL LOOPED DAL
1EE84	ه	ARABIC MATHEMATICAL LOOPED HEH
1EE85	و	ARABIC MATHEMATICAL LOOPED WAW
1EE86	ز	ARABIC MATHEMATICAL LOOPED ZAIN
1EE87	ح	ARABIC MATHEMATICAL LOOPED HAH
1EE88	ط	ARABIC MATHEMATICAL LOOPED TAH
1EE89	ى	ARABIC MATHEMATICAL LOOPED YEH
1EE8A		\<reserved\>
1EE8B	ل	ARABIC MATHEMATICAL LOOPED LAM
1EE8C	م	ARABIC MATHEMATICAL LOOPED MEEM
1EE8D	ں	ARABIC MATHEMATICAL LOOPED NOON
1EE8E	س	ARABIC MATHEMATICAL LOOPED SEEN
1EE8F	ع	ARABIC MATHEMATICAL LOOPED AIN
1EE90	ڡ	ARABIC MATHEMATICAL LOOPED FEH
1EE91	ص	ARABIC MATHEMATICAL LOOPED SAD
1EE92	ٯ	ARABIC MATHEMATICAL LOOPED QAF
1EE93	ر	ARABIC MATHEMATICAL LOOPED REH
1EE94	ش	ARABIC MATHEMATICAL LOOPED SHEEN
1EE95	ت	ARABIC MATHEMATICAL LOOPED TEH

1EE96	ث	ARABIC MATHEMATICAL LOOPED THEH
1EE97	خ	ARABIC MATHEMATICAL LOOPED KHAH
1EE98	ذ	ARABIC MATHEMATICAL LOOPED THAL
1EE99	ض	ARABIC MATHEMATICAL LOOPED DAD
1EE9A	ظ	ARABIC MATHEMATICAL LOOPED ZAH
1EE9B	غ	ARABIC MATHEMATICAL LOOPED GHAIN

Double-struck symbols

1EEA1	ٮ	ARABIC MATHEMATICAL DOUBLE-STRUCK BEH
1EEA2	ح	ARABIC MATHEMATICAL DOUBLE-STRUCK JEEM
1EEA3	د	ARABIC MATHEMATICAL DOUBLE-STRUCK DAL
1EEA4		\<reserved\>
1EEA5	و	ARABIC MATHEMATICAL DOUBLE-STRUCK WAW
1EEA6	ز	ARABIC MATHEMATICAL DOUBLE-STRUCK ZAIN
1EEA7	ح	ARABIC MATHEMATICAL DOUBLE-STRUCK HAH
1EEA8	ط	ARABIC MATHEMATICAL DOUBLE-STRUCK TAH
1EEA9	ى	ARABIC MATHEMATICAL DOUBLE-STRUCK YEH
1EEAA		\<reserved\>
1EEAB	ل	ARABIC MATHEMATICAL DOUBLE-STRUCK LAM
1EEAC	م	ARABIC MATHEMATICAL DOUBLE-STRUCK MEEM
1EEAD	ں	ARABIC MATHEMATICAL DOUBLE-STRUCK NOON
1EEAE	س	ARABIC MATHEMATICAL DOUBLE-STRUCK SEEN
1EEAF	ع	ARABIC MATHEMATICAL DOUBLE-STRUCK AIN
1EEB0	ڡ	ARABIC MATHEMATICAL DOUBLE-STRUCK FEH
1EEB1	ص	ARABIC MATHEMATICAL DOUBLE-STRUCK SAD
1EEB2	ٯ	ARABIC MATHEMATICAL DOUBLE-STRUCK QAF
1EEB3	ر	ARABIC MATHEMATICAL DOUBLE-STRUCK REH
1EEB4	ش	ARABIC MATHEMATICAL DOUBLE-STRUCK SHEEN
1EEB5	ت	ARABIC MATHEMATICAL DOUBLE-STRUCK TEH
1EEB6	ث	ARABIC MATHEMATICAL DOUBLE-STRUCK THEH
1EEB7	خ	ARABIC MATHEMATICAL DOUBLE-STRUCK KHAH
1EEB8	ذ	ARABIC MATHEMATICAL DOUBLE-STRUCK THAL
1EEB9	ض	ARABIC MATHEMATICAL DOUBLE-STRUCK DAD
1EEBA	ظ	ARABIC MATHEMATICAL DOUBLE-STRUCK ZAH
1EEBB	غ	ARABIC MATHEMATICAL DOUBLE-STRUCK GHAIN

Stretching operators

The following operators stretch based on the width of the text that is displayed below or above them.

1EEF0	مح	ARABIC MATHEMATICAL OPERATOR MEEM WITH HAH WITH TATWEEL

→ 2211 $\sum$ n-ary summation
• Used in Arabic mathematics to denote summation
• Stretched at the tatweel

1EEF1	حد	ARABIC MATHEMATICAL OPERATOR HAH WITH DAL

• Used in Persian mathematics to denote limits
• Stretched between the hah and the dal

ISO/IEC JTC 1/SC 2/WG 2
PROPOSAL SUMMARY FORM TO ACCOMPANY SUBMISSIONS
FOR ADDITIONS TO THE REPERTOIRE OF ISO/IEC 10646[1]
Please fill all the sections A, B and C below.
Please read Principles and Procedures Document (P & P) from http://www.dkuug.dk/JTC1/SC2/WG2/docs/principles.html **for guidelines and details before filling this form.**
Please ensure you are using the latest Form from http://www.dkuug.dk/JTC1/SC2/WG2/docs/summaryform.html.
See also http://www.dkuug.dk/JTC1/SC2/WG2/docs/roadmaps.html **for latest** *Roadmaps.*

A. Administrative

1. **Title:** *Proposal to Add Arabic Mathematical Alphabetic Symbols*
2. Requester's name: *Azzeddine Lazrek, Murray Sargent, Roozbeh Pournader, Deborah Anderson*
3. Requester type (Member body/Liaison/Individual contribution): *Liaison Contribution (Script Encoding Initiative)*
4. Submission date: *04 April 2010*
5. Requester's reference (if applicable):
6. Choose one of the following:
    This is a complete proposal: *Complete*
    (or) More information will be provided later:

B. Technical – General

1. Choose one of the following:
    a. This proposal is for a new script (set of characters): *new block*
        Proposed name of script: *Arabic Mathematical Alphabetic Symbols*
    b. The proposal is for addition of character(s) to an existing block:
        Name of the existing block:
2. Number of characters in proposal: *143*
3. Proposed category (select one from below - see section 2.2 of P&P document):
    A-Contemporary   *x*   B.1-Specialized (small collection)   B.2-Specialized (large collection)
    C-Major extinct   D-Attested extinct   E-Minor extinct
    F-Archaic Hieroglyphic or Ideographic   G-Obscure or questionable usage symbols
4. Is a repertoire including character names provided? *yes*
    a. If YES, are the names in accordance with the "character naming guidelines"
        in Annex L of P&P document? *yes*
    b. Are the character shapes attached in a legible form suitable for review? *yes*
5. Fonts related:
    a. Who will provide the appropriate computerized font to the Project Editor of 10646 for publishing the standard?
    Roozbeh Pournader
    b. Identify the party granting a license for use of the font by the editors (include address, e-mail, ftp-site, etc.):
    Azzeddine Lazrek with Roozbeh Pournader
6. References:
    a. Are references (to other character sets, dictionaries, descriptive texts etc.) provided? *See N3085-1*
    b. Are published examples of use (such as samples from newspapers, magazines, or other sources)
    of proposed characters attached? *Contained in N3085-1 (L2/05-319)*
7. Special encoding issues:
    Does the proposal address other aspects of character data processing (if applicable) such as input, presentation, sorting, searching, indexing, transliteration etc. (if yes please enclose information)? *No*

8. Additional Information:

Submitters are invited to provide any additional information about Properties of the proposed Character(s) or Script that will assist in correct understanding of and correct linguistic processing of the proposed character(s) or script. Examples of such properties are: Casing information, Numeric information, Currency information, Display behaviour information such as line breaks, widths etc., Combining behaviour, Spacing behaviour, Directional behaviour, Default Collation behaviour, relevance in Mark Up contexts, Compatibility equivalence and other Unicode normalization related information. See the Unicode standard at http://www.unicode.org for such information on other scripts. Also see http://www.unicode.org/Public/UNIDATA/UCD.html and associated Unicode Technical Reports for information needed for consideration by the Unicode Technical Committee for inclusion in the Unicode Standard.

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[1] Form number: N3702-F (Original 1994-10-14; Revised 1995-01, 1995-04, 1996-04, 1996-08, 1999-03, 2001-05, 2001-09, 2003-11, 2005-01, 2005-09, 2005-10, 2007-03, 2008-05, 2009-11)

C. Technical - Justification

1. Has this proposal for addition of character(s) been submitted before? — *yes*
   If YES explain — *N3085-1 (L2/05-319) was an earlier version of this proposal*
2. Has contact been made to members of the user community (for example: National Body,
   user groups of the script or characters, other experts, etc.)? — *yes*
   If YES, with whom? — *Azzeddine Lazrek, Cadi Ayyad University, Marrakesh, Morocco and others*
   If YES, available relevant documents:
3. Information on the user community for the proposed characters (for example:
   size, demographics, information technology use, or publishing use) is included? — *221 million speakers*
   Reference: — *Ethnologue 2009 (web version)*
4. The context of use for the proposed characters (type of use; common or rare) — *common*
   Reference:
5. Are the proposed characters in current use by the user community? — *yes*
   If YES, where? Reference:
6. After giving due considerations to the principles in the P&P document must the proposed characters be entirely
   in the BMP? — *N/A*
   If YES, is a rationale provided?
   If YES, reference:
7. Should the proposed characters be kept together in a contiguous range (rather than being scattered)? — *yes*
8. Can any of the proposed characters be considered a presentation form of an existing
   character or character sequence? — *no*
   If YES, is a rationale for its inclusion provided?
   If YES, reference:
9. Can any of the proposed characters be encoded using a composed character sequence of either
   existing characters or other proposed characters? — *no*
   If YES, is a rationale for its inclusion provided?
   If YES, reference:
10. Can any of the proposed character(s) be considered to be similar (in appearance or function)
    to an existing character? — *yes*
    If YES, is a rationale for its inclusion provided? — *yes*
    If YES, reference: — *rationale is provided in this proposal (these are symbols with no joining behaviour)*
11. Does the proposal include use of combining characters and/or use of composite sequences? — *no*
    If YES, is a rationale for such use provided?
    If YES, reference:
    Is a list of composite sequences and their corresponding glyph images (graphic symbols) provided?
    If YES, reference:
12. Does the proposal contain characters with any special properties such as
    control function or similar semantics? — *no*
    If YES, describe in detail (include attachment if necessary)

13. Does the proposal contain any Ideographic compatibility character(s)? — *no*
    If YES, is the equivalent corresponding unified ideographic character(s) identified?
    If YES, reference: