Arabic Mathematical Old Symbols,
Additional characters proposed to Unicode
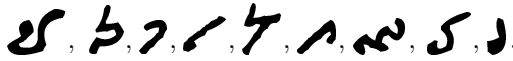
Azzeddine Lazrek

lazrek@ucam.ac.ma

Cadi Ayyad University, Faculty of Sciences

P.O. Box 2390, Marrakech, Morocco
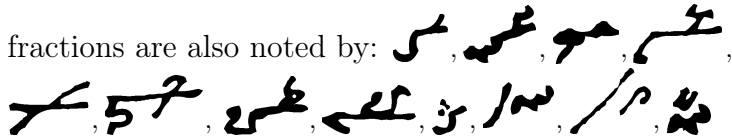
Phone: +212 44 43 46 49 Fax: +212 44 43 74 09

URL: http://www.ucam.ac.ma/fssm/rydarab

July 10, 2005

A special system of Arabic-Indic numerals has been in use in North Africa *rumy* since the X^e century. It remained in use until the $XVII^e$ century. This system has been especially used in the administration of the city of Fès in Morocco. It has also been used in Spain starting from the XIIe century. The forms of the digits are quiet different from the Arabic or the Arabic-Indic digits in use today. The system of numeration was decimal, but not positional. There are Arabic-Rwmy digits (see Table 1), Arabic-Rwmy numbers (see Table 2) and Arabic-Rwmy fractions (see Table 3). It has been described by the mathematician Ibn Al-Banna (1256-1321, Marrakech) in his famous book [1] "Abstract of using rwmy in calculus" in Arabic (namely AlAYqtDAb mn al-Eml b-al-rwmI fI al-HsAb). This system is also known as "time letters, calculus letters, Roman, Fès letters" (namely Hrwf al-zmAn, Hrwf al-HsAb, al-rwmI, Hrwf fAs).

- Arabic-Rwmy unities are: , , , , , , , , .

- Arabic-Rwmy tens are: , , , , , , , , .

- Arabic-Rwmy hundreds are: , , , , , , , , .

- Arabic-Rwmy thousands are noted by one bar under the number (ex., for three thousands);

1

- Arabic-Rwmy million are noted by two bars under the number (ex., $\underline{\underline{2}}$ for three million);

- and so on.

- fractions are also noted by: [Arabic symbols], [Arabic symbols]

The **Rwmy** and **AntiSym** fonts available, includes all these characters. In **Rwmy** font, the shapes of the reference glyphs are scanned from [1], in OpenType format and converted in METAFONT as a LaTeX package [3]. In **AntiSym** font, glyphs are drawing by hand in METAFONT as a LaTeX package [2].

Some boxes are add to some symbols in Figures in order to emphases them and understand the purpose of the samples.

More information about this presentation is available in [4].

References

[1] Ibn Al-Banna (1256-1321, Marrakech), *Abstract of using Rwmy in calculus*, in Arabic.

[2] Arabic mathematical old symbols package antisym for LaTeX, http://www.ucam.ac.ma/fssm/rydarab/system/zip/antisym1_3.zip.

[3] Rwmy Arabic mathematical old symbols package rwmy for LaTeX, http://www.ucam.ac.ma/fssm/rydarab/system/zip/rwmy1_1.zip.

[4] Arabic mathematical symbols for Unicode, http://www.ucam.ac.ma/fssm/rydarab/english/unicode.htm.

𞸀 ARABIC-RWMY DIGIT ONE
≈ 0031 1 digit one
≈ 0661 ١ Arabic-Indic digit one

𞸁 ARABIC-RWMY DIGIT TWO
≈ 0032 2 digit two
≈ 0662 ٢ Arabic-Indic digit two

𞸂 ARABIC-RWMY DIGIT THREE
≈ 0033 3 digit three
≈ 0663 ٣ Arabic-Indic digit three

𞸃 ARABIC-RWMY DIGIT four
≈ 0034 4 digit four
≈ 0664 ٤ Arabic-Indic digit four

𞸄 ARABIC-RWMY DIGIT FIVE
≈ 0035 5 digit five
≈ 0665 ٥ Arabic-Indic digit five

𞸅 ARABIC-RWMY DIGIT SIX
≈ 0036 6 digit six
≈ 0666 ٦ Arabic-Indic digit six

𞸆 ARABIC-RWMY DIGIT SEVEN
≈ 0037 7 digit seven
≈ 0667 ٧ Arabic-Indic digit seven

𞸇 ARABIC-RWMY DIGIT EIGHT
≈ 0038 8 digit eight
≈ 0668 ٨ Arabic-Indic digit eight

𞸈 ARABIC-RWMY DIGIT NINE
≈ 0039 9 digit nine
≈ 0669 ٩ Arabic-Indic digit nine

Table 1: Arabic-Rwmy digits

ك	ARABIC-RWMY NUMBER TEN • used as a symbol with a numeric value of 10
ڡ	ARABIC-RWMY NUMBER TWENTY • used as a symbol with a numeric value of 20
ه	ARABIC-RWMY NUMBER THIRTY • used as a symbol with a numeric value of 30
٤	ARABIC-RWMY NUMBER FORTY • used as a symbol with a numeric value of 40
ى	ARABIC-RWMY NUMBER FIFTY • used as a symbol with a numeric value of 50
ح	ARABIC-RWMY NUMBER SIXTY • used as a symbol with a numeric value of 60
ل	ARABIC-RWMY NUMBER SEVENTY • used as a symbol with a numeric value of 70
ш	ARABIC-RWMY NUMBER EIGHTY • used as a symbol with a numeric value of 80
ے	ARABIC-RWMY NUMBER NINETY • used as a symbol with a numeric value of 90
ﻉ	ARABIC-RWMY NUMBER HUNDRED • used as a symbol with a numeric value of 100
ﻱ	ARABIC-RWMY NUMBER TWO HUNDRED • used as a symbol with a numeric value of 200
ﻄ	ARABIC-RWMY NUMBER TREE HUNDRED • used as a symbol with a numeric value of 300
ﻩ	ARABIC-RWMY NUMBER FOUR HUNDRED • used as a symbol with a numeric value of 400
ρ	ARABIC-RWMY NUMBER FIVE HUNDRED • used as a symbol with a numeric value of 500
ﻯ	ARABIC-RWMY NUMBER SIX HUNDRED • used as a symbol with a numeric value of 600
ﻉ	ARABIC-RWMY NUMBER SEVEN HUNDRED • used as a symbol with a numeric value of 700
ﻠ	ARABIC-RWMY NUMBER EIGHT HUNDRED • used as a symbol with a numeric value of 800
e	ARABIC-RWMY NUMBER NINE HUNDRED • used as a symbol with a numeric value of 900

Table 2: Arabic-Rwmy numbers

ﻙ ARABIC-RWMY
- used as a symbol with a numeric value of 1/2

ﻊﻤﻋ ARABIC-RWMY
- used as a symbol with a numeric value of 2/3

ﻊﻤﺤﯾ ARABIC-RWMY
- used as a symbol with a numeric value of 3/4

ﻮﻤﺟ ARABIC-RWMY
- used as a symbol with a numeric value of 4/5

ﺦﻤﺤﻟ ARABIC-RWMY
- used as a symbol with a numeric value of 5/6

ﺦﻤﺧ ARABIC-RWMY
- used as a symbol with a numeric value of 6/7

ﻊﻤﺠﻟ ARABIC-RWMY
- used as a symbol with a numeric value of 7/8

ﻊﻤﻄﻋ ARABIC-RWMY
- used as a symbol with a numeric value of 8/9

ﻊﻤﻜﻟ ARABIC-RWMY
- used as a symbol with a numeric value of 9/10

ﻥ ARABIC-RWMY
- used as an other symbol with a numeric value of 1/2

ﻞﺳ ARABIC-RWMY
- used as a symbol with a numeric value of 1/3

ﻢﻟ ARABIC-RWMY
- used as a symbol with a numeric value of 1/4

ﺐﺤﺼﻟ ARABIC-RWMY
- used as an other symbol with a numeric value of 2/3

Table 3: Arabic-Rwmy fractions

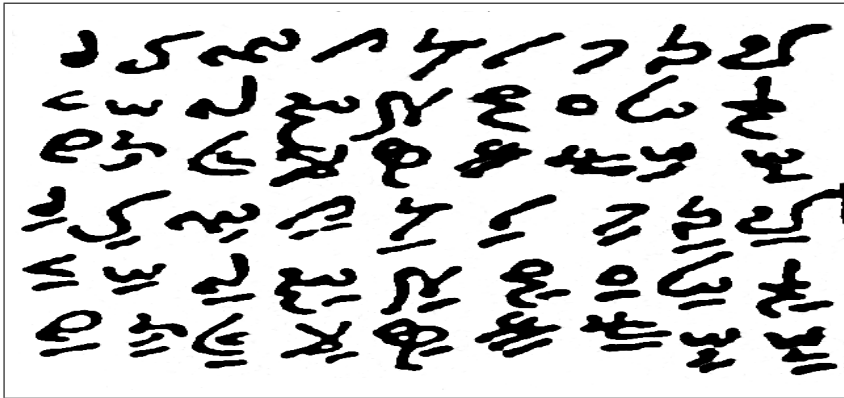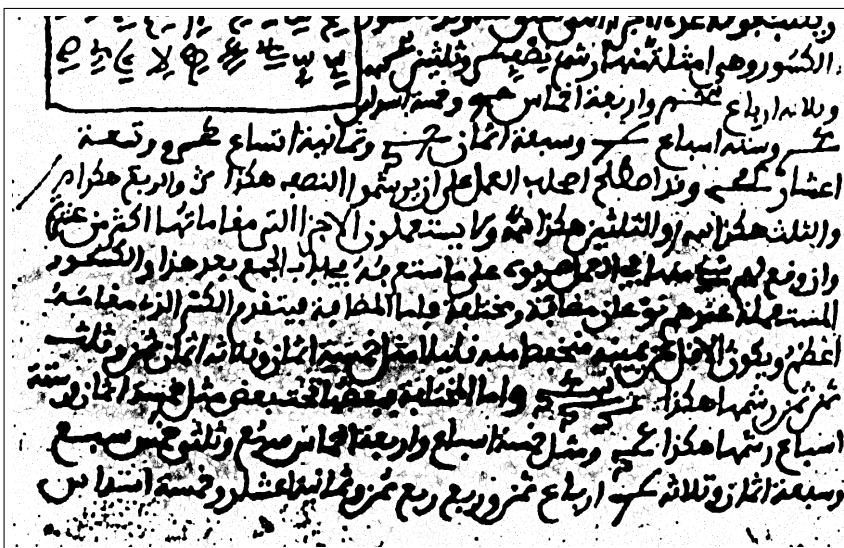Figure 1: Rwmy numeral system in old book [2.1]

Figure 2: Integer Rwmy symbols in old book [2.1]

Figure 3: Fraction Rwmy symbols in old book [2.1]