

To: Unicode Technical Committee

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Subject: Garay mathematical notation

Date: March 20, 2019

The attached pages include information on Garay mathematical notation, in response to the request by the Unicode Script Ad Hoc to provide further examples of Garay math symbols.

New information was gathered on math symbols that were not documented in the original Garay script proposal; it is included on the following pages and can eventually be folded into a revised proposal on Garay.

Garay mathematical notation

It seems that the notation reported by Souleiman Faye reflects modern usage, adapted to western practices, which is typical for mathematics.

From this source, <https://catalogingafricana.files.wordpress.com/2016/03/fayems2-1.pdf>,

Assane Faye, *Mathematique Moderne. Cours secondaire; première année.*

There might be a need for additional symbols to encode, in particular:

GARAY DIVISION MARK	+
GARAY ADDITION MARK [or GARAY PLUS]	T
GARAY SUBTRACTION MARK [or GARAY MINUS]	L
GARAY MULTIPLICATION MARK [equivalent to GARAY CAPITAL Y]	∞

+ for division mark

(cf. p. 11 in the abovementioned PDF and note Western comma as the decimal separator while Arabic comma is used in text).

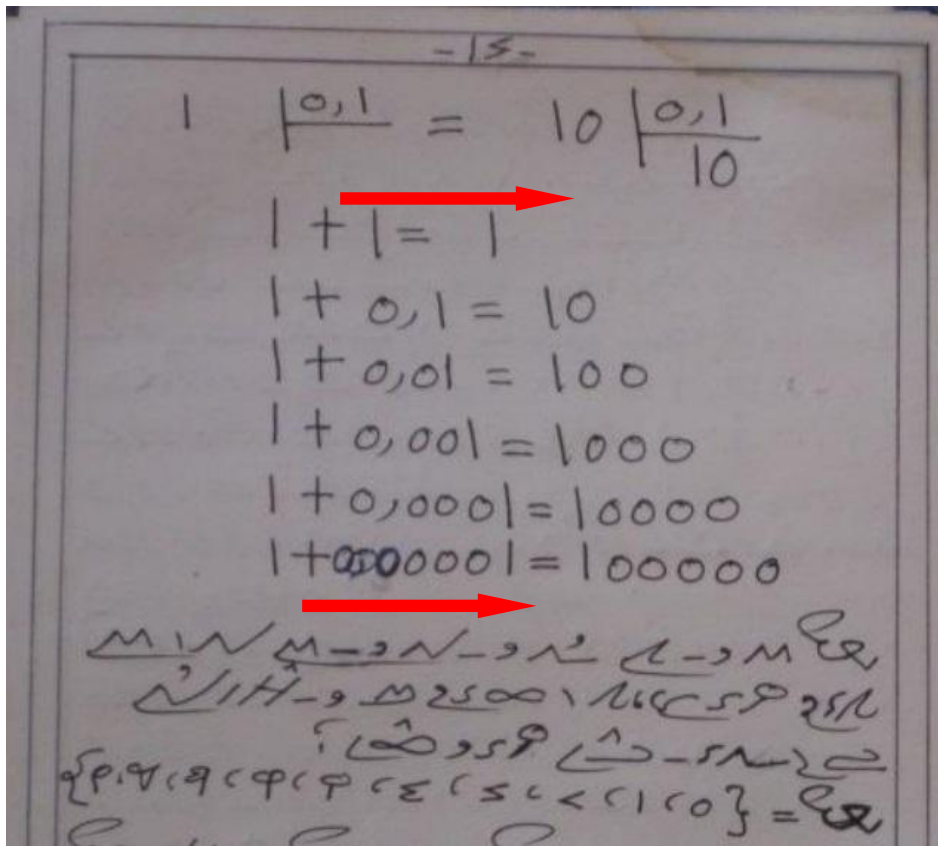


Figure 1: Sample of Garay division.

Note that either zero or comma is missing in the top row, which should read

$$1 \left| \begin{array}{l} 0,1 \\ \hline \end{array} \right. = 1,0 \left| \begin{array}{l} 0,1 \\ \hline 10 \end{array} \right.$$

Subsequent rows correspond to:

- 1 : 1 = 1
- 1 : 0,1 = 10
- 1 : 0,01 = 100
- etc.

Note the order of the division operation, which is left to right contrary to other examples given below.

Arabic commas < , > U+060C can be seen in particular in the bottom row, where the set of digits is written in the curly braces {...}.

T used for plus

(see especially p. 40ff)

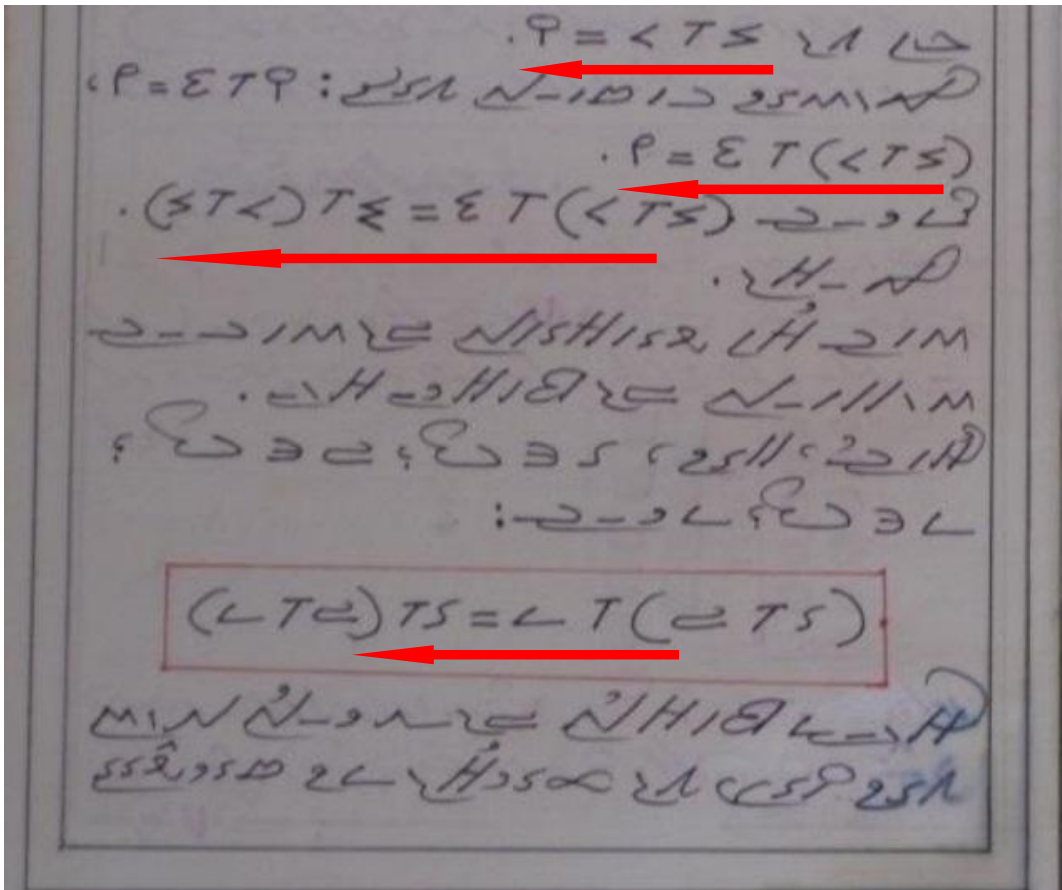


Figure 2: Sample of Garay addition.

Examples in the 1st, 3rd, and 4th rows read (right to left):

- 3 + 2 = 5
- (3 + 2) + 4 = 9
- (3 + 2) + 4 = 4 + (2 + 3)

The rule about the associative nature of the addition operation is given in the red rectangle:

$$a + (b + c) = (a + b) + c$$

⊥ used for minus
(see especially p. 40ff)

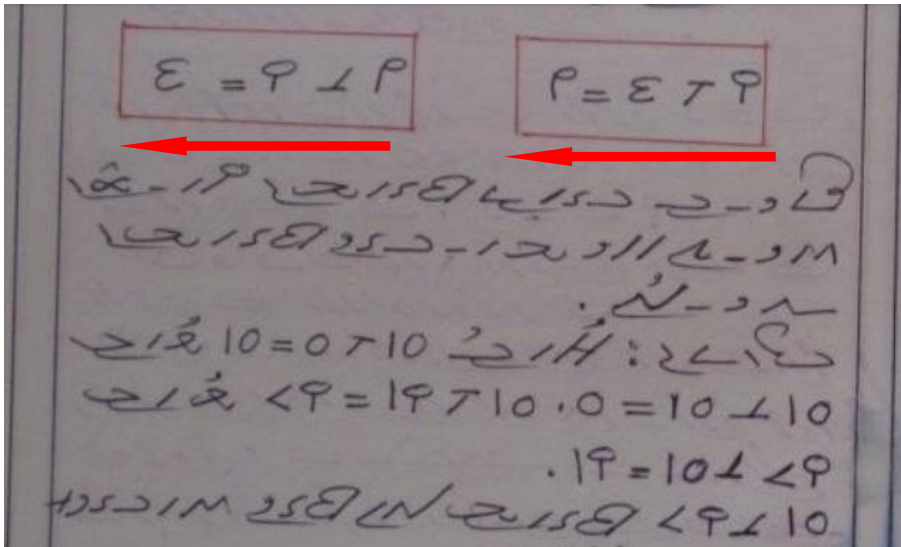


Figure 3: Sample of Garay subtraction.

Examples in red rectangles read (note the direction, right to left!):
 $9 - 5 = 4$ $5 + 4 = 9$

Garay capital Y used for multiplication
(see p. 59).

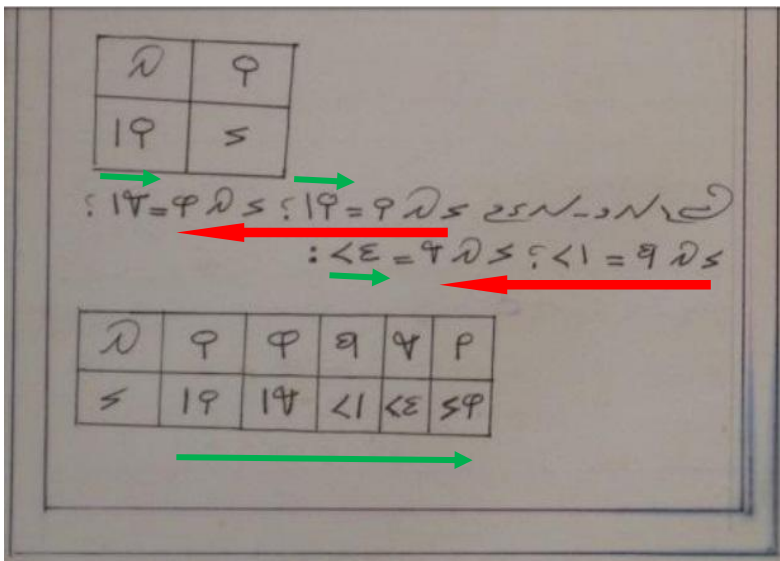


Figure 4: Sample of Garay multiplication. Red arrows show the order of operations while green arrows demonstrate that the digits are written with the highest digit to the left (like in the western digits and in the Arabic digits).

The first table reads:

×	5
15	3

The two following lines contain some other multiplication examples, namely:

$3 \times 5 = 15$; $3 \times 6 = 18$;

$3 \times 7 = 21$; $3 \times 8 = 24$,

which are summarized in the bottom table

containing the multiplication by 3:

×	5	6	7	8	9
3	15	18	21	24	27

Compare the above notation with the recent sample by Souleiman Faye:

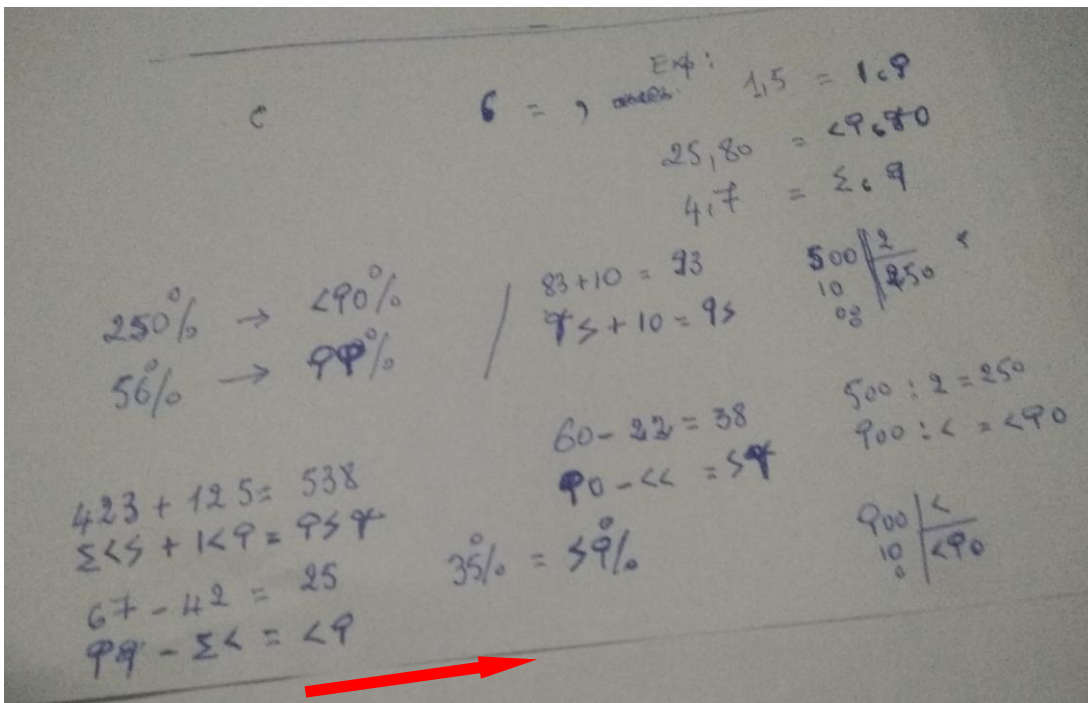


Figure 5. Modern usage of the mathematical notation. Note the placement of the percentage symbol $\langle \% \rangle$ and use of the Arabic comma \langle , \rangle as the decimal separator.

Section sign

For the section sign, we don't have attestations of its use from existing texts.

Charles Riley did work on two mockups with Suleiman to show different ways of how it could be used:

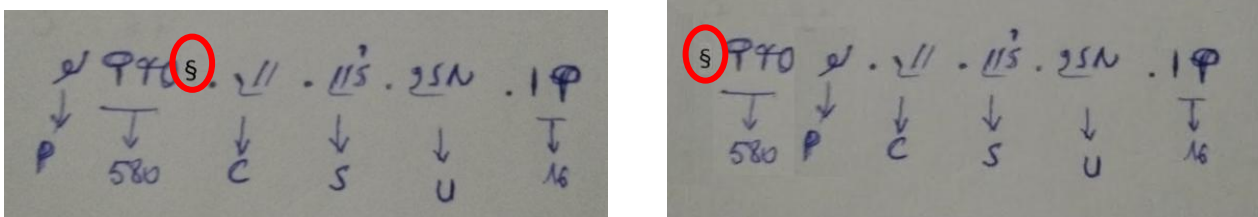


Figure 6. Two possible placements of the section symbol $\langle § \rangle$ in the sample string "16 U.S.C. § 580p".

We are inconclusive on what the desired result should be. Additional discussion is needed to confirm how the community wants to see it used.