

The Universe of Discourse

Wed, 12 Aug 2015

A message to the aliens, part 2/23 (arithmetic)

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This is page 2 of the [Cosmic Call](#) message. An explanation follows.







Reminder: [the previous page](#) explained the ten digits:




0 1 2 3 4 5 6 7 8 9

This page, headed with the glyph for “mathematics” , explains the arithmetic operations on numbers.

The page is in five sections, three on top and two below.

The first four sections explain addition , subtraction , multiplication , and division . Each is explained with a series of five typical arithmetic equalities. For example, $4 \times 3 = 12$:



The subtraction sign actually appeared back on [page 1](#) in the Mersenne prime $2^{3021377} - 1$   .

The negative sign  is introduced in connection with subtraction, since $1 - 2 = -1$:




Note that the negative-number sign is not the same as the subtraction sign.

The decimal point  is introduced in connection with division. For example, $3 \div 2 = 1.5$:




There is also an attempt to divide by zero:



It's not clear what the authors mean by this; the mysterious glyph  does not appear anywhere else in the document. What did they think it meant? Infinity? Indeterminate? Well, I found out later they published a cheat sheet, which assigns the meaning "undetermined" to this glyph. Not a great choice, in my opinion, because $1 \div 0$ is not numerically equal to anything.

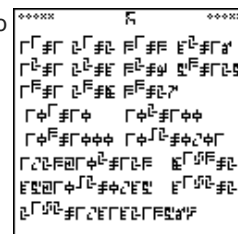
For some reason, perhaps because of space limitations, the authors have stuck the equation $0 - 1 = -1$ at the bottom of the division section.

The fifth section, at lower right, displays some nonterminating decimal fractions and introduces  the ellipsis or '...' symbol. For example, $1 \div 9 = 0.1111 \dots$:



I would have put $2 \div 27 = 0.0740 \dots$ here instead of $2 \div 3$, which I think is too similar to the other examples.

The [next article](#), to appear 2015-08-14, will discuss page 3, shown at right. (Click to enlarge.) Try to figure it out before then.



[\[Other articles in category /aliens/dd\]](#) [permanent link](#)