A Number System of Their Own

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Atlas Obscura

SOLUTIONS

Challenge 1

Equation i) shows a symbol with four strokes, from which is subtracted a symbol with three strokes, leaving a single stroke. An intuitive guess would be that this is the equation 4 – 3 = 1. Equation ii) is therefore 2 multiplied by *a*, which equals 𝋈—the symbol for 3 with an extra horizontal stroke. A glance at all the other numbers on the page shows that all of them, apart from 𝋀, are combinations of up-and-down strokes and side-to-side strokes. Our assumption from i) is that the up-and-down strokes are units, since we have seen 1, 2, 3, and 4. There are never more than four of these units, so we can deduce that writing 5 requires another symbol, which could very well be a side-to-side stroke. If this is true, then 𝋈 might be 5 (horizontal stroke) + 3 (vertical strokes) = 8. Thus *a* = 4, or 𝋄. Equation iii) gives us confirmation of this theory, since it reads 4 + 8 = 12 (12 being composed of two horizontal strokes and two vertical ones). Equation iv) states that one less than *b* is 14. So *b* = 15, which will be three horizontal strokes, or 𝋏.

We have worked out the system for single-digit Kaktovik numerals, and the remaining equations show how the system works for two-digit numbers. Equation v) reveals that 𝋁𝋀 – 4 = 16. Thus, 𝋁𝋀 = 20. The Kaktovik system reveals itself as a positional base 20-system, meaning that once we get to 20, we need to have a column for the 20s and a column for the single digits (up to 19). This is just like the decimal system, where once we get to 10, we need a column for the 10s and a column for single digits up to 9. We can deduce that 𝋀 is the zero symbol, so 𝋁𝋀 means a single 20, and zero of the digit that counts from one to 19.

We can check this theory with equation vi). It contains two 20s and 16, which is 56, and that divided by 7 makes 8, or 𝋈. Equation vii) says that 5 multiplied by *c* is 30. Thus *c* = 6 = 𝋆.

So:

a = 𝋄

b = 𝋏

c = 𝋆

Solutions continue on the following page.

Source: North American Computational Linguistics Olympiad

Challenge 2

For the Iñupiaq words, we know can translate the following Arabic numerals from our solutions to the equations:

atausiq	1
tallimat pinasut	8
qulit malguk	12
akimiagutailaq	14
akimiaq atausiq	16
iñuiññaq qulit	30

The numerals were designed to be useful for Iñupiaq words, and therefore it would seem to make sense that the words are counting in blocks of 5 up to 20. In other words, we can deduce that *tallimat* is 5 and *pinasut* is 3; *qulit* is 10 and *malguk* is 2; and *akimiaq* and *iñuiññaq* are 15 and 20. The irregular one is 14, but this looks like some form of ”one from 15.”

So, we come to the conclusion that:

3 is *pinasut*

11 is *qulit atausiq*

22 is *iñuiññaq malguk*

In summary, the Iñupiaq count in ones and fives in a base-20 system, and the numerals were designed to reflect that by using two basic strokes: vertical for single units and horizontal for fives.