Slighty Better Numbers

Negative Base Integers

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October 9, 2022

The Problem

One of the biggest problems facing mathematics is the - sign.

$$-15 - -5 = -10$$

It just looks awful.

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$$-15 - -5 = -10$$

It just looks awful.
What if my text editor thought I meant to use an em-dash!
I'd never show my face around here ever again.

The solution

Negative Bases

In base 10 the current year is denoted 2022.

$$10^3 * 2 + 10^2 * 0 + 10^1 * 2 + 10^0 * 2$$

$$1000 * 2 + 100 * 0 + 10 * 2 + 1 * 2$$

The solution

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$$1000 * 2 + 100 * 0 + 10 * 2 + 1 * 2$$

Archimedes was born 2309 years ago in the year:

$$10^2 * -2 + 10^1 * -8 + 10^0 * -7$$

Pretty clunky. It's almost enough to make a mathematician use letters.

Negadecimal

Encoding in base -10 can be called Negadecimal. In negadecimal 2022 denotes:

$$-10^3 * 2 + -10^2 * 0 + -10^1 * 2 + -10^0 * 2$$

$$-1000 * 2 + 100 * 0 + -10 * 2 + 1 * 2$$

Or -2018 in laynumber.

Negadecimal

The current year in negadecimal is 18182.

$$10^4 * 1 + -10^3 * 8 + -10^2 * 1 + -10^1 * 8 + -10^0 * 2$$

$$10000 * 1 - 1000 * 8 + 100 * 1 - 10 * 8 + 2$$

Negadecimal

Converting Base-10 to Base–10

The algorithm for correcting numbers is simple. Calculate the digits from least significance by taking the positive remainder after successive divisions by -10. To ensure the remainder is positive, when the number is negative, add ten to the remainder and carry the one.

I wonder what 11 looks like in negadecimal...

Negabinary

Two's Complement

Storing signed integers in binary is treated as a solved problem with Two's Complement being the dominant solution.

Essentially the most significant bit is taken to be negative.

This feels pretty clunky.

Negabinary

The worst thing is, this leads to a lot of documents to be interrupted by the same explanation that number range from -2^{b-1} to $2^{b-1} - 1$ (e.g. -128 to 127).
The horror.
In fixed width negabinary the least value is -2 * the greatest value (e.g. -170 to 85 in 8 bits)

If this all seems to simple

Donald Knuth proposed quater-imaginary system, using base 2i and representing all complex numbers (to arbitrary precision) using the digits 0,1,2,3.
Base -1+i can also be used to represent all Gaussian Integers (a+i*b).