

How does Nature calculate? Which is primary: Magnitude or Symbol?

Magnitudes without a pre-appointed location. "Pips"

"It From Bit"

Number

Symbol

Base: 0, 1 or digits 0, ..., 9

$\mathbb{N} = \{0, 1, 2, 3, \dots\}$ Jargon: "2-adic"

$\mathbb{N}^+ = \{1, 2, 3, \dots\}$ simple prefix a 1

$\mathbb{Z} = \{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$

gives us subtraction as an op.

$\mathbb{Q} = \{\text{rational numbers}\}$
gives us division (not by 0)

FIELD

$\mathbb{R} = \{\text{real numbers}\}$

Also field, but not countable.

$\mathbb{C} = \{\text{complex numbers}\}$ A field.

Can solve all arithmetic eqns

Alphabets of characters

eg. Dig = $\{0, 1, 2, \dots, 9\}$.

$\Sigma^* = \{\lambda, 0, 1, 00, 01, 10, 11, \dots\}$

Empty string: ϵ or λ Standard Order ("Lex")

Aardsma, David

Aaron, Henry Home Run

In Standard Order, record until 200.

"Aaron" is still first because

$|Aaron| = 5 < |Aardsma| = 7$

Strings \leftrightarrow Numbers

Languages = Sets of Strings

or numbers
Not ordered.