## Why

We return to our discussion of symbols and scripts, to make precise these concepts in the language of sets and lists.

## Definition

An *alphabet* is a finite set. For example, let $A$ be the set

$$\{a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z\},$$

where $a$ denotes the latin lower case letter "a", $b$ denotes the latin lower case letter "b", and so on. In other words, $A$ is the set of lowercase latin letters. It is an alphabet. By analogy with this familiar case, we frequently refer to the elements of an alphabet as *letters* or *symbols*.

A *word* is a list of letters in an alphabet, and a *phrase* is a list of words. For example, $(c, a, t, s)$ is a word in $\mathcal{A}$ (mean to correspond to the word "cats") and

$$((c, a, t, s), (a, n, d), (d, o, g, s))$$

is a phrase in $\mathcal{A}$ (meant to correspond to the phrase "cats and dogs").

## Strings

Let $A$ be an alphabet. In this case (in which $A$ is a finite set), we refer to the lists of $A$ as *strings*. The string whose length is zero is the empty set.

## Notation

We denote the set of all lists (strings) in $A$ by $\mathsf{str}(A)$. We read $\mathsf{str}(A)$ aloud as "the strings in $A$."

Alphabets

Lists

Direct Products

Set Numbers

Finite Sets

Equivalent Sets

Family Unions and Intersections

Natural Order

Function Inverses

Families

Function Composites

Function Images

Peano Axioms

Functions

Equivalence Relations

Natural Induction

Relations

Set Products

Generalized Set Dualities

Natural Numbers

Set Powers

Set Dualities

Set Unions and Intersections

Intersection of Empty Set

Successor Sets

Unordered Triples

Partitions

Set Complements

Pair Unions

Set Intersections

Ordered Pairs

Set Differences

Pair Intersections

Set Unions

Empty Set

Unordered Pairs

Set Specification

Set Equality

Set Inclusion

Standardized Accounts

Accounts

Deductions

Quantified Statements

Logical Statements

Statements

Identities

Sets

Names

Letters

Objects