Why

We want to talk about probability over finite sets.

Definition

A *probability distribution* or *probability mass function* is a real-valued function from a set of outcomes which is non-negative and normalized. A real-valued function on a finite set is *normalized* if the sum of its results is 1. We will refer to these as *distributions*. The *probability of an outcome* is the result of the outcome under the distribution.

Notation

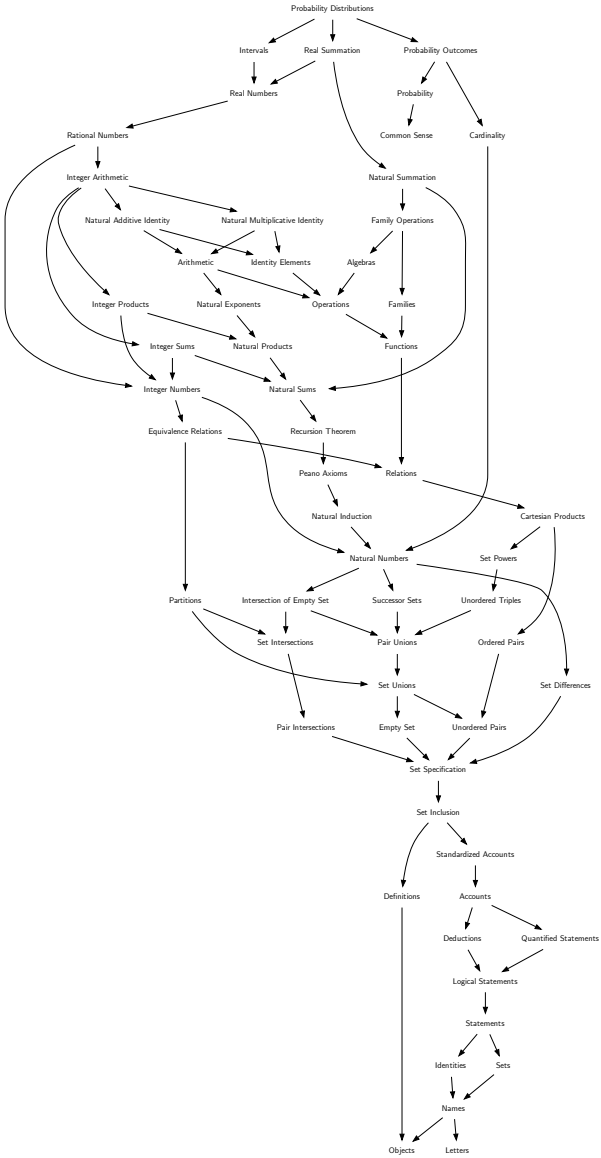
Let A be a set of outcomes and Let $p : A \to \mathbf{R}$ be a distribution; then

- $p(a) > 0$ for each $a \in A$ and
- $\sum_{a \in A} p(a) = 1$

PROPOSITION **1.** *If $p : A \to \mathbf{R}$ is a distribution, then $p(A) \subset [0, 1]$.*

Proof. Let $a \in A$. First, $p(a) \geq 0$ by definition. Second, since p is normalized, $\sum_{b \in A} p(b) = 1$. And $p(a) \leq \sum_{b \in A} p(b)$, so $p(a) \leq 1$.

$\square$


Probability Distributions
Intervals
Real Summation
Probability Outcomes
Real Numbers
Probability
Rational Numbers
Common Sense
Cardinality
Integer Arithmetic
Natural Summation
Natural Additive Identity
Natural Multiplicative Identity
Family Operations
Arithmetic
Identity Elements
Algebras
Integer Products
Natural Exponents
Operations
Families
Integer Sums
Natural Products
Functions
Integer Numbers
Natural Sums
Equivalence Relations
Recursion Theorem
Peano Axioms
Relations
Natural Induction
Cartesian Products
Natural Numbers
Set Powers
Partitions
Intersection of Empty Set
Successor Sets
Unordered Triples
Set Intersections
Pair Unions
Ordered Pairs
Set Unions
Set Differences
Pair Intersections
Empty Set
Unordered Pairs
Set Specification
Set Inclusion
Standardized Accounts
Definitions
Accounts
Deductions
Quantified Statements
Logical Statements
Statements
Identities
Sets
Names
Objects
Letters