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

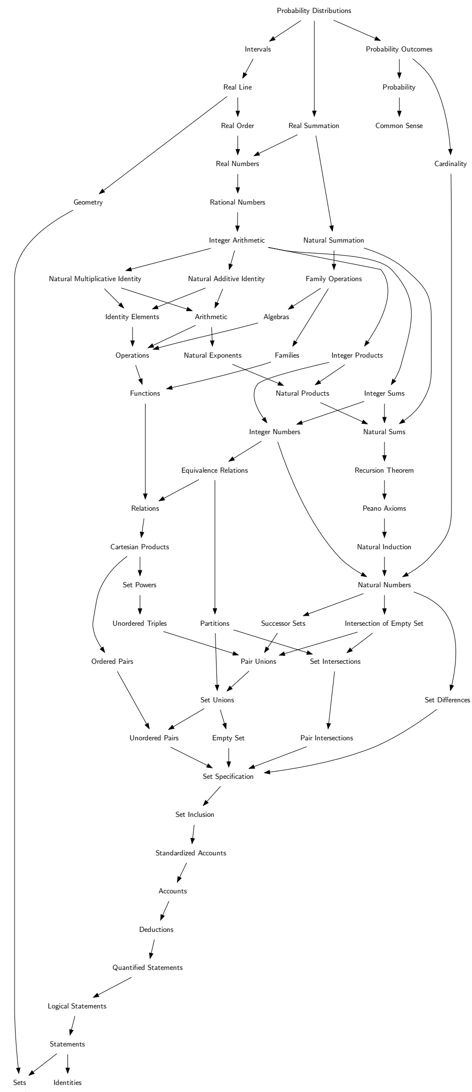
Let A be a set of outcomes and let $p : A \to \mathbf{R}$ be a distribution. Then

$$p(a) \geq 0 \text{ for all } a \in A \text{ and } \sum_{a \in A} p(a) = 1.$$

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 $p(a) \leq 1$.

□



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