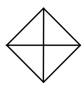


Why

We can identify probability distributions with vectors.

Definition

Let $p : \Omega \to \mathsf{R}$ be a probability distribution on a finite set $\Omega = \{\omega_1, \dots, \omega_n\}$. We can associate p with the vector $x \in \mathsf{R}^n$ defined by $x_i = p(\omega_i)$ for $i = 1, \dots, n$. We call this vector y the *probability vector* associated with p. The conditions on p mean that (1) $\langle 1, y \rangle = 1$ and (2) $y \geq 0$ (i.e., $y_i \geq 0$ for all $i = 1, \dots, n$.).

Conversely, suppose $z \in \mathsf{R}$ satifies (1) and (2). Then $q : \Omega \to \mathsf{R}$ defined by $q(\omega_i) = z_i$ for $i = 1, \dots, n$ is a probability distribution. For this reason, we call z satisfying the conditions a *distribution vector*. Notice that implicit in this correspondence is a numbering $\omega : \{1, \dots, n\} \to \Omega$ of the set of outcomes Ω.

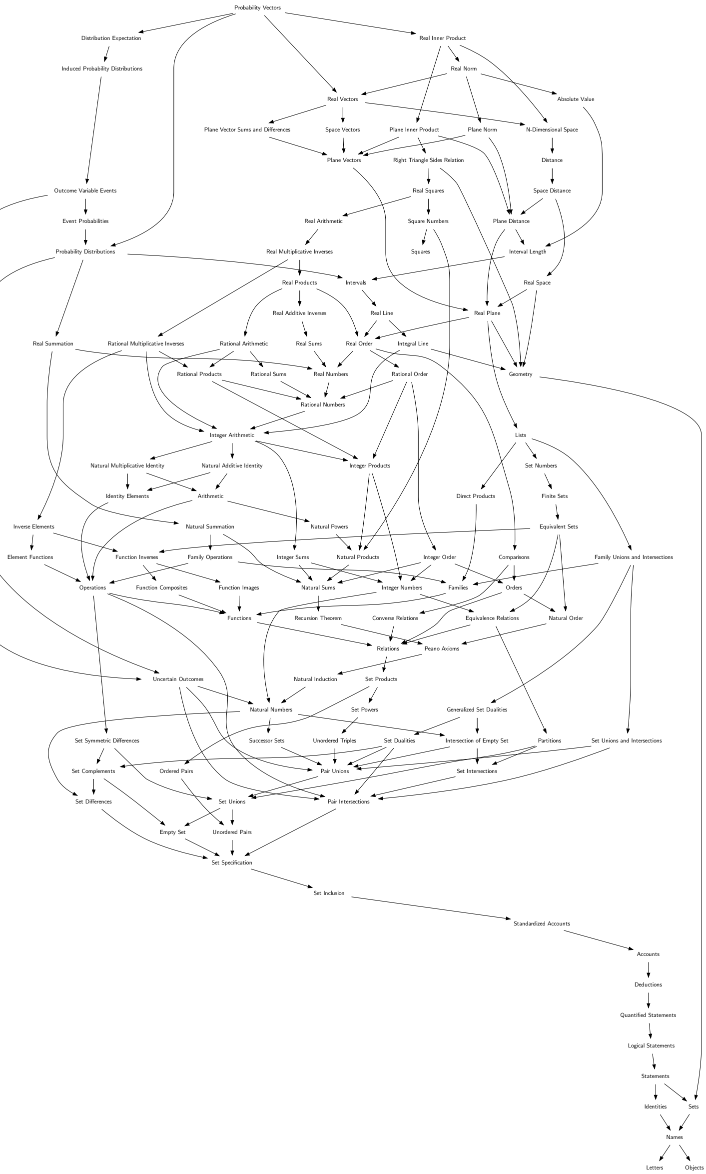
Expectation

Suppose $\rho \in \mathsf{R}^n$ is a distribution vector corresponding to $p : \Omega \to \mathsf{R}$ its corresponding distribution. Let $x : \Omega \to \mathsf{R}$ and (similar to ρ) define $\xi \in \mathsf{R}^n$ by $\xi_i = x(\omega_i)$ for $i = 1, \dots, n$. Then $\mathsf{E}x = \langle \rho, \xi \rangle$.

Example

For $\rho = (-1, -1, 1, 1, 2)$ and $\xi = (0.1, 0.15, 0.1, 0.25, 0.4)$

$$\mathsf{E}x = \langle \rho, \xi \rangle - 1 - 0.15 + 0.1 + 0.25 + 2(0.4) = 0.9.$$


Probability Vectors
Distribution Expectation
Real Inner Product
Induced Probability Distributions
Real Norm
Real Vectors
Absolute Value
Plane Vector Sums and Differences
Space Vectors
Plane Inner Product
Plane Norm
N-Dimensional Space
Plane Vectors
Right Triangle Sides Relation
Distance
Outcome Variable Events
Real Squares
Space Distance
Event Probabilities
Real Arithmetic
Square Numbers
Plane Distance
Probability Distributions
Real Multiplicative Inverses
Squares
Interval Length
Real Products
Intervals
Real Space
Real Additive Inverses
Real Line
Real Plane
Real Summation
Rational Multiplicative Inverses
Rational Arithmetic
Real Sums
Real Order
Integral Line
Rational Products
Rational Sums
Real Numbers
Rational Order
Geometry
Rational Numbers
Integer Arithmetic
Lists
Natural Multiplicative Identity
Natural Additive Identity
Integer Products
Set Numbers
Identity Elements
Arithmetic
Direct Products
Finite Sets
Inverse Elements
Natural Summation
Natural Powers
Equivalent Sets
Element Functions
Function Inverses
Family Operations
Integer Sums
Natural Products
Integer Order
Comparisons
Family Unions and Intersections
Operations
Function Composites
Function Images
Natural Sums
Integer Numbers
Families
Orders
Functions
Recursion Theorem
Converse Relations
Equivalence Relations
Natural Order
Relations
Peano Axioms
Uncertain Outcomes
Natural Induction
Set Products
Natural Numbers
Set Powers
Generalized Set Dualities
Set Symmetric Differences
Successor Sets
Unordered Triples
Set Dualities
Intersection of Empty Set
Partitions
Set Unions and Intersections
Set Complements
Ordered Pairs
Pair Unions
Set Intersections
Set Differences
Set Unions
Pair Intersections
Empty Set
Unordered Pairs
Set Specification
Set Inclusion
Standardized Accounts
Accounts
Deductions
Quantified Statements
Logical Statements
Statements
Identities
Sets
Names
Letters
Objects