Why

A probability event function is a measure on the set of outcomes.

Definition

A *probability measure* is a finite measure on a measurable space which assigns the value one to the base set. A finite measure can always be scaled to a probability measure, so these measures are standard examples of finite measures.

A *probability space* is a measure space whose measure is a probability measure. The word "space" is natural, since the notion of a measure generalized the notion of volume in real space (see Real Space and N-Dimensional Space). The *outcomes* of a probability space are the elements of the base set. The *set of outcomes* is the base set. The *events* are the elements of the sigma algebra. The measure in a probability space corresponds to the event probability function.

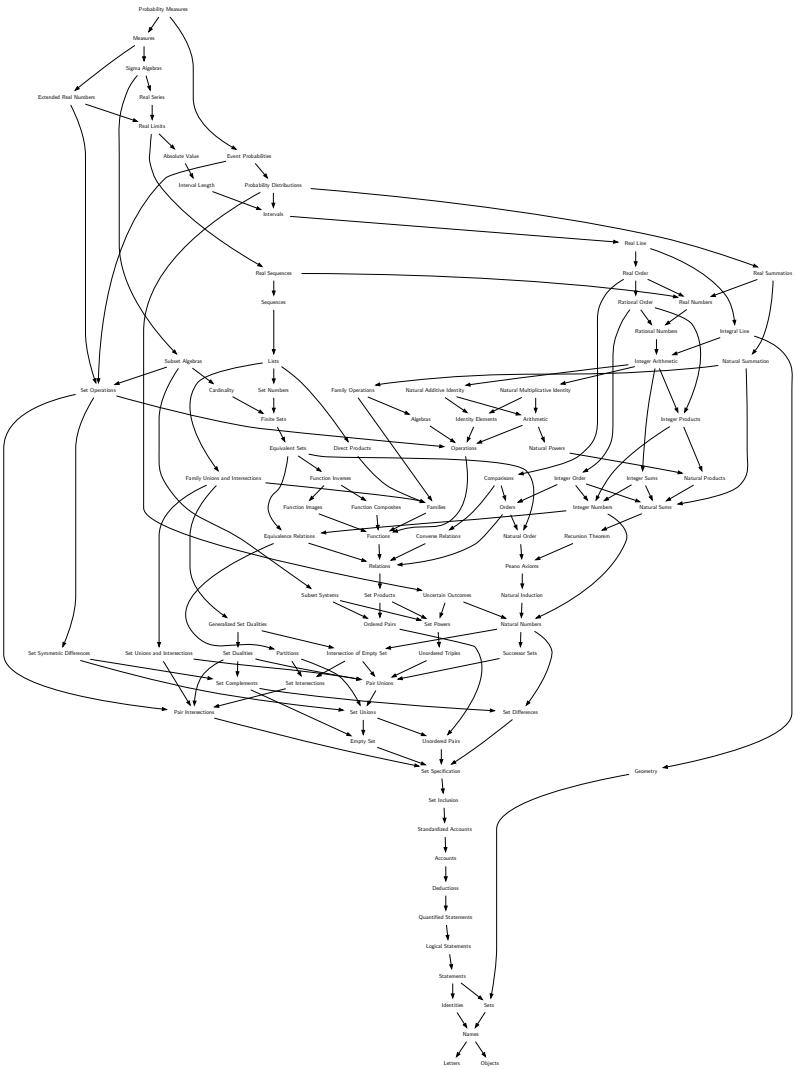
Notation

Let $(A, \mathcal{A})$ be a measurable space.[1] We denote the sigma-algebra by $\mathcal{A}$, as usual. We denote a probability measure by P, a mnemonic for "probability," and intended to remind of the event probabilty function. Thus, we often say "Let $(A, \mathcal{A}, \mathsf{P})$

[1] Often, other authors will denote the set of outcomes (here denoted by A) by Ω, an apparent mnemonic for "outcomes".

be a probability space."

Many authors associate an event $A \in \mathcal{A}$ with a function $\pi : \mathcal{X} \to \{0, 1\}$ so that $A = \{x \in \mathcal{X} \mid \pi(x) = 1\}$. In this context, it is common to write $\mu[\pi(x)]$ for $\mu(A)$.


Probability Measures
Measures
Sigma Algebras
Extended Real Numbers
Real Series
Real Limits
Absolute Value
Event Probabilities
Interval Length
Probability Distributions
Intervals
Real Line
Real Summation
Real Order
Real Numbers
Real Sequences
Sequences
Rational Order
Rational Numbers
Integral Line
Integer Arithmetic
Natural Summation
Subset Algebras
Lists
Set Operations
Cardinality
Set Numbers
Family Operations
Natural Additive Identity
Natural Multiplicative Identity
Finite Sets
Algebras
Identity Elements
Arithmetic
Integer Products
Equivalent Sets
Direct Products
Operations
Natural Power
Family Unions and Intersections
Function Inverses
Comparisons
Integer Order
Integer Sums
Natural Products
Function Images
Function Composites
Families
Orders
Integer Numbers
Natural Sums
Equivalence Relations
Functions
Converse Relations
Natural Order
Recursion Theorem
Relations
Peano Axioms
Subset Systems
Set Products
Uncertain Outcomes
Natural Induction
Generalized Set Dualities
Ordered Pairs
Set Powers
Natural Numbers
Set Symmetric Differences
Set Unions and Intersections
Set Dualities
Partitions
Intersection of Empty Set
Unordered Triples
Successor Sets
Set Complements
Set Intersections
Pair Unions
Pair Intersections
Set Unions
Set Differences
Empty Set
Unordered Pairs
Set Specification
Geometry
Set Inclusion
Standardized Accounts
Accounts
Deductions
Quantified Statements
Logical Statements
Statements
Identities
Sets
Names
Letters
Objects