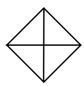


Why

TODO

Definition

A *random variable* is a measurable map from a probability space to a measurable space.

A *real-valued random variable* is a measurable map between the probability space and the set of real numbers with its topological sigma algebra.

Notation

Let $(X, \mathcal{A}, \mathbf{P})$ be a probability space. Let $(Y, \mathcal{B})$ a measurable space. Then a random variable is a measurable function $f : X \to Y$.

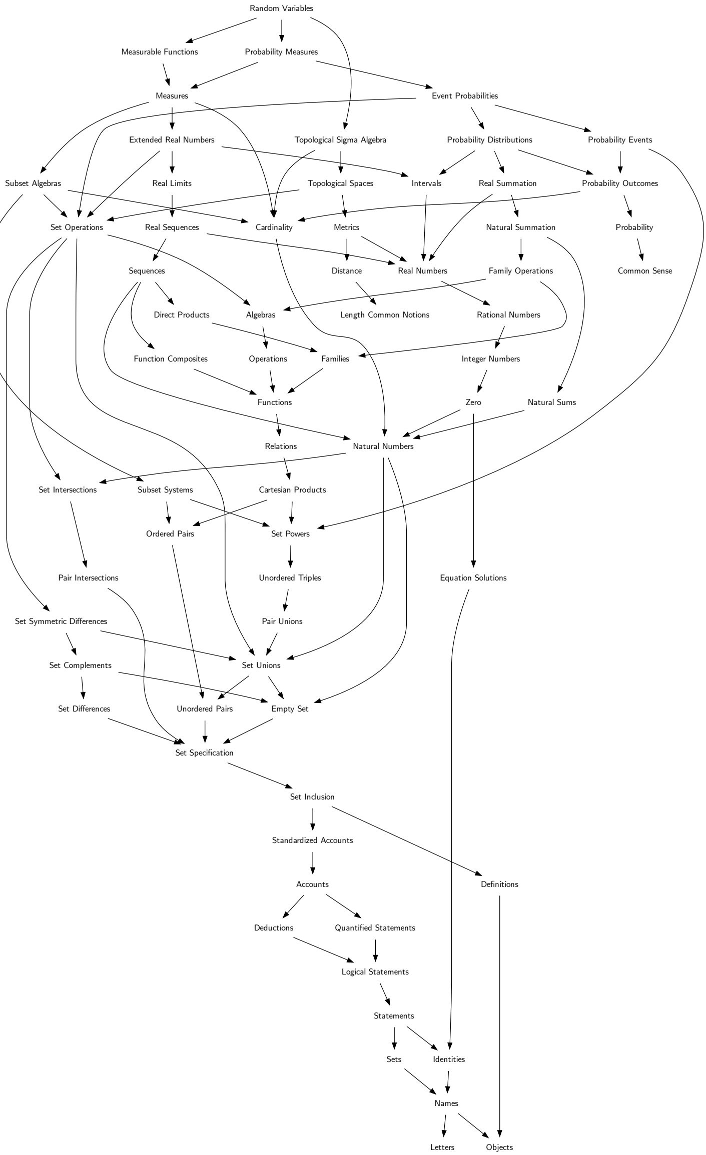
Some authors denote real-valued random variables by upper case Latin letters: for example, X, Y, Z. In this case, the base probability space is denoted by Ω, a mnemonic for "outcomes.". Let $(\Omega, \mathcal{A}, \mathbf{P})$ be a probability space. Let $X : \Omega \to \mathsf{R}$ be measurable. Then X is a real-valued random variable.

Some authors use notation for the probability of certain common sets. Let $A \in \mathcal{B}(R)$. Let $\mathbf{P}(X \in A)$ denote $\mathbf{P}(X^{-1}(A))$. These are equivalent to

$$\mathbf{P}(\{\omega \in \Omega \mid X(\omega) \in A\}).$$

Next, let $Y : \Omega \to R$ a measurable function and let $B \in \mathcal{B}(R)$. Similar to the above, let $\mathbf{P}(X \in A, Y \in B)$ denote $\mathbf{P}(X^{-1}(A) \cap Y^{-1}(B))$. These are equivalent to

$$\mathbf{P}(\{\omega \in \Omega \mid X(\omega) \in A \text{ and } Y(\omega) \in B\}).$$


Random Variables
Measurable Functions
Probability Measures
Measures
Event Probabilities
Extended Real Numbers
Topological Sigma Algebra
Probability Distributions
Probability Events
Subset Algebras
Real Limits
Topological Spaces
Intervals
Real Summation
Probability Outcomes
Set Operations
Real Sequences
Cardinality
Metrics
Natural Summation
Probability
Sequences
Distance
Real Numbers
Family Operations
Common Sense
Direct Products
Algebras
Length Common Notions
Rational Numbers
Function Composites
Operations
Families
Integer Numbers
Functions
Zero
Natural Sums
Relations
Natural Numbers
Set Intersections
Subset Systems
Cartesian Products
Ordered Pairs
Set Powers
Pair Intersections
Unordered Triples
Equation Solutions
Set Symmetric Differences
Pair Unions
Set Complements
Set Unions
Set Differences
Unordered Pairs
Empty Set
Set Specification
Set Inclusion
Standardized Accounts
Accounts
Definitions
Deductions
Quantified Statements
Logical Statements
Statements
Sets
Identities
Names
Letters
Objects