Why

If we have some outcomes and a probability mass function, we can construct a function which assigns probabilities to events.

Definition

The *probability* of an event is the sum of the probabilities of the outcomes in the event. The *event probability function* is the correspondence assigning events to their probabilities.

Notation

Let A be a set of outcomes and p a probability mass function on A. Let $B \subset A$ be an event. Let $\mathbf{P} : 2^A \to R$ be the event probability function:

$$\mathbf{P}(B) = \sum_{b \in B} p(b).$$

Notice that $\mathbf{P}$ depends on the set of outcomes A and the probability mass function p. Sometimes we will include this when denoting $\mathbf{P}$ and denote it by $\mathbf{P}_{A,p}$.

Properties

PROPOSITION **1.** *Let* $\mathbf{P}$ *be the event probability function of a probability mass function* p *on a set of outcomes* A. *then*

    1. $\mathbf{P}(B) \geq 0$ *for all* $B \subset A$

2. $\mathbf{P}(A) = 1$

3. $\mathbf{P}(B \cup C) = \mathbf{P}(B) + \mathbf{P}(C)$ *for* $B, C \subset A$ *and* $B \cap C = \varnothing$

Event Probabilities

Probability Distributions

Intervals   Real Summation

Real Numbers   Natural Summation   Probability Events

Rational Numbers   Set Operations   Natural Sums   Family Operations   Probability Outcomes

Integer Numbers   Algebras   Cardinality   Families   Probability

Zero   Operations   Injective Functions   Power Set   Common Sense

Equation Solutions   Natural Numbers   Set Symmetric Differences   Functions

Set Intersections   Set Unions   Relations

Set Complements   Ordered Pairs

Equations   Unordered Pairs

Set Specification

Set Inclusion

Empty Set

Set Equality

Identity   Standardized Accounts

Accounts

Deductions   Quantified Statements

Logical Statements

Statements

Sets   Identities

Objects