Why

Suppose we are going to make a bunch of measurements. We associate to each element of a finite set a number. If the measurements we make are divided into proportions according to a distribution, if we make all the measurements and then average the results what do we expect to get.

Definition

Consider a distribution p and a real-valued function f. The *distribution expectation*f f *under* p is the sum of the product of the results of p and f on the elements of the set.

Notation

Let A a finite set. Let R denote the set of real numbers. Let $p : A \to R$. Let $f : A \to R$. The expectation of f under p is

$$\sum_{a \in A} p(a)f(a).$$

Distribution Expectation

Probability Distributions

Intervals

Real Line

Real Summation · Real Order

Real Numbers

Rational Numbers

Integral Line

Integer Arithmetic

Natural Summation

Family Operations · Natural Additive Identity · Natural Multiplicative Identity

Families · Algebras · Identity Elements · Arithmetic

Integer Sums · Integer Products · Operations · Natural Powers

Integer Numbers · Functions · Natural Products · Comparisons

Natural Sums · Equivalence Relations · Converse Relations · Orders

Recursion Theorem · Relations · Natural Order

Geometry

Peano Axioms

Uncertain Outcomes · Natural Induction · Set Products

Set Powers · Natural Numbers

Unordered Triples · Successor Sets · Intersection of Empty Set · Partitions

Pair Unions · Set Intersections · Ordered Pairs

Set Unions · Set Differences

Pair Intersections · Empty Set · Unordered Pairs

Set Specification

Set Inclusion

Standardized Accounts

Accounts

Deductions

Quantified Statements

Logical Statements

Statements

Identities · Sets

Names

Letters · Objects