## Definition

The *entropy* of a distribution is the expectation of the negative logarithm of the distribution under the distribution. It is sometimes called the *discrete entropy* to distinguish it with another related topic.[1]

## Notation

Let $A$ be a finite set. Let $p : A \to \mathbf{R}$ be a distribution. The entropy of $p$ is

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

We denote the entropy of $p$ by $H(p)$.

## Properties

Let $x : \Omega \to V$ be a discrete random variable.

1. $H(x) \geq 0$

2. $H(f(x)) \leq H(x)$

3. For invertible $g$, $H(g(x)) \leq H(x)$

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[1]Future editions may not forward reference differential entropy.

Discrete Entropy

Logarithm

Exponential Function

Outcome Probabilities

Real Functions

Intervals

Real Line

Real Order

Real Numbers

Real Summation

Natural Summation

Rational Order

Integral Line

Rational Numbers

Natural Fractions

Lists

Set Numbers

Integer Arithmetic

Direct Products

Integer Products

Natural Additive Identity

Natural Multiplicative Identity

Finite Sets

Identity Elements

Natural Arithmetic

Equivalent Sets

Family Unions and Intersections

Natural Powers

Integer Sums

Integer Order

Comparisons

Family Operations

Function Inverses

Natural Products

Integer Numbers

Orders

Operations

Families

Function Images

Function Composites

Natural Sums

Natural Order

Converse Relations

Functions

Equivalence Relations

Recursion Theorem

Peano Axioms

Relations

Ordered Pair Projections

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

Pair Unions

Set Intersections

Ordered Pairs

Set Differences

Set Unions

Pair Intersections

Empty Set

Unordered Pairs

Geometry

Set Specification

Set Equality

Set Inclusion

Deductions

Quantified Statements

Logical Statements

Statements

Sets

Identities

Names

Letters

Objects