

# Proof

## Proof

*Alcohol proof, a measure of an alcoholic drink's strength Proof may also refer to: Formal proof, a construct in proof theory Mathematical proof, a convincing*

Proof most often refers to:

Proof (truth), argument or sufficient evidence for the truth of a proposition

Alcohol proof, a measure of an alcoholic drink's strength

Proof may also refer to:

## Mathematical proof

*A mathematical proof is a deductive argument for a mathematical statement, showing that the stated assumptions logically guarantee the conclusion. The*

A mathematical proof is a deductive argument for a mathematical statement, showing that the stated assumptions logically guarantee the conclusion. The argument may use other previously established statements, such as theorems; but every proof can, in principle, be constructed using only certain basic or original assumptions known as axioms, along with the accepted rules of inference. Proofs are examples of exhaustive deductive reasoning that establish logical certainty, to be distinguished from empirical arguments or non-exhaustive inductive reasoning that establish "reasonable expectation". Presenting many cases in which the statement holds is not enough for a proof, which must demonstrate that the statement is true in all possible cases. A proposition that has not been proved but is believed...

## Proof theory

*Proof theory is a major branch of mathematical logic and theoretical computer science within which proofs are treated as formal mathematical objects,*

Proof theory is a major branch of mathematical logic and theoretical computer science within which proofs are treated as formal mathematical objects, facilitating their analysis by mathematical techniques. Proofs are typically presented as inductively defined data structures such as lists, boxed lists, or trees, which are constructed according to the axioms and rules of inference of a given logical system. Consequently, proof theory is syntactic in nature, in contrast to model theory, which is semantic in nature.

Some of the major areas of proof theory include structural proof theory, ordinal analysis, provability logic, proof-theoretic semantics, reverse mathematics, proof mining, automated theorem proving, and proof complexity. Much research also focuses on applications in computer science...

## Constructive proof

*In mathematics, a constructive proof is a method of proof that demonstrates the existence of a mathematical object by creating or providing a method for*

In mathematics, a constructive proof is a method of proof that demonstrates the existence of a mathematical object by creating or providing a method for creating the object. This is in contrast to a non-constructive proof (also known as an existence proof or pure existence theorem), which proves the existence of a

particular kind of object without providing an example. For avoiding confusion with the stronger concept that follows, such a constructive proof is sometimes called an effective proof.

A constructive proof may also refer to the stronger concept of a proof that is valid in constructive mathematics.

Constructivism is a mathematical philosophy that rejects all proof methods that involve the existence of objects that are not explicitly built. This excludes, in particular, the use of the...

#### Proof of space

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Proof of space (PoS) is a type of consensus algorithm achieved by demonstrating one's legitimate interest in a service (such as sending an email) by allocating a non-trivial amount of memory or disk space to solve a challenge presented by the service provider. The concept was formulated in 2013 by Dziembowski et al. and (with a different formulation) by Ateniese et al..

Proofs of space are very similar to proofs of work (PoW), except that instead of computation, storage is used to earn cryptocurrency. Proof-of-space is different from memory-hard functions in that the bottleneck is not in the number of memory access events, but in the amount of memory required.

After the release of Bitcoin, alternatives to its PoW mining mechanism were researched, and PoS was studied in the context of cryptocurrencies...

#### Proof coinage

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Proof coinage refers to special early samples of a coin issue, historically made for checking the dies (as in demonstrating that something is true) and for archival purposes. In modern times, proofs are often struck in greater numbers, especially for coin collectors (numismatists). Nearly all countries have issued proof coinage.

Preparation of a proof striking usually involved polishing of the dies. They can usually be distinguished from normal circulation coins by their sharper rims and design, as well as much smoother "fields" — the blank areas which are not part of the coin's design.

The dies for making modern proof coins are often treated with chemicals to make certain parts of the design take on a frosted appearance, with the polished fields taking on a mirror finish. Several other methods...

#### Proof by contradiction

*In logic, proof by contradiction is a form of proof that establishes the truth or the validity of a proposition by showing that assuming the proposition*

In logic, proof by contradiction is a form of proof that establishes the truth or the validity of a proposition by showing that assuming the proposition to be false leads to a contradiction.

Although it is quite freely used in mathematical proofs, not every school of mathematical thought accepts this kind of nonconstructive proof as universally valid.

More broadly, proof by contradiction is any form of argument that establishes a statement by arriving at a contradiction, even when the initial assumption is not the negation of the statement to be proved. In this general sense, proof by contradiction is also known as indirect proof, proof by assuming the opposite, and *reductio ad impossibile*.

A mathematical proof employing proof by contradiction usually proceeds as follows:

The proposition to...

Formal proof

*In logic and mathematics, a formal proof or derivation is a finite sequence of sentences (known as well-formed formulas when relating to formal language)*

In logic and mathematics, a formal proof or derivation is a finite sequence of sentences (known as well-formed formulas when relating to formal language), each of which is an axiom, an assumption, or follows from the preceding sentences in the sequence, according to the rule of inference. It differs from a natural language argument in that it is rigorous, unambiguous and mechanically verifiable. If the set of assumptions is empty, then the last sentence in a formal proof is called a theorem of the formal system. The notion of theorem is generally effective, but there may be no method by which we can reliably find proof of a given sentence or determine that none exists. The concepts of Fitch-style proof, sequent calculus and natural deduction are generalizations of the concept of proof.

The...

Alcohol proof

*Alcohol proof (usually termed simply "proof" in relation to a beverage) is a measure of the content of ethanol (alcohol) in an alcoholic beverage. The*

Alcohol proof (usually termed simply "proof" in relation to a beverage) is a measure of the content of ethanol (alcohol) in an alcoholic beverage. The term was originally used in England and from 1816 was equal to about 1.75 times the percentage of alcohol by volume (ABV). The United Kingdom today uses ABV instead of proof. In the United States, alcohol proof is defined as twice the percentage of ABV. The definition of proof in terms of ABV varies from country to country.

The measurement of alcohol content and the statement of content on bottles of alcoholic beverages is regulated by law in many countries. In 1972, Canada phased out the use of "proof"; in 1973, the European Union followed suit; and the United Kingdom, where the concept originated, started using ABV instead in 1980. The United...

Proof assistant

*mathematical logic, a proof assistant or interactive theorem prover is a software tool to assist with the development of formal proofs by human-machine collaboration*

In computer science and mathematical logic, a proof assistant or interactive theorem prover is a software tool to assist with the development of formal proofs by human-machine collaboration. This involves some sort of interactive proof editor, or other interface, with which a human can guide the search for proofs, the details of which are stored in, and some steps provided by, a computer.

A recent effort within this field is making these tools use artificial intelligence to automate the formalization of ordinary mathematics.

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