

Logical Argument

From www.Wikipedia.com

Logical Argument

In logic, an **argument** is an attempt to demonstrate the truth of an assertion called a *conclusion*, based on the truth of a set of assertions called *premises*. The process of demonstration of deductive (see also deduction) and inductive reasoning shapes the argument, and presumes some kind of communication, which could be part of a written text, a speech or a conversation.

Overview

In ordinary, philosophical and scientific argumentation [abductive](#) arguments and arguments by [analogy](#) are also commonly used. Arguments can be *valid* or *invalid*, although how arguments are determined to be in either of these two categories can often itself be an object of much discussion. Informally one should expect that a valid argument should be *compelling* in the sense that it is capable of convincing someone about the truth of the conclusion. However, such a criterion for validity is inadequate or even misleading since it depends more on the skill of the person constructing the argument to manipulate the person who is being convinced and less on the argument itself.

Less subjective criteria for validity of arguments are often clearly desirable, and in some cases we should even expect an argument to be [rigorous](#), that is, to adhere to precise rules of validity. This is the case for arguments used in mathematical proofs. Note that a rigorous proof does not have to be a [formal proof](#).

In ordinary language, people refer to the *logic of an argument* or use terminology that suggests that an argument is based on [inference rules](#) of [formal logic](#). Though arguments do use inferences that are indisputably purely logical (such as syllogisms), other kinds of inferences are almost always used in practical arguments. For example, arguments commonly deal with [causality](#), [probability](#) and [statistics](#) or even specialized areas such as [economics](#). In these cases, *logic* refers to the structure of the argument rather than to principles of pure logic that might be used in it.

Informal Logic

Informal logic or **non-formal logic** is the study of [arguments](#) as presented in ordinary language, as contrasted with the presentations of arguments in an artificial, formal, or technical language (see [formal logic](#)). Johnson and Blair (1987) define informal logic as "a branch of logic whose task is to develop non-formal standards, criteria, procedures for the analysis, interpretation, evaluation, criticism and construction of argumentation in everyday discourse."

Opinion pieces of newspapers provide illustrative textbook examples of informal logic (Walton 1989), usually because these pieces are short and often fallacious. However, informal logic is also used to reason about events in the human and social sciences. In fact, most reasoning from known facts to unknown facts that uses natural language, even if combined with mathematical or

statistical reasoning, can be regarded as an application of informal logic so long as it does not rely on additional empirical evidence.

In the [social sciences](#) many arguments are based on applications of [statistics](#) to demonstrate correlation or lack thereof between sets of variables, such as levels of income and education, ethnicity and wealth and so on. Such arguments are based on theories of statistical hypothesis testing together with empirical data accumulated by [polling](#), collection of historical records, long term studies etc. [Econometrics](#) is the branch of economics that applies statistics to economics. Besides statistics, economists use a wide variety of analytical tools, for example, calculus, qualitative reasoning about systems of equations, asymptotic analysis (theories of growth), and so on.

Argument Validity

In evaluating an argument, we consider separately the [truth](#) of the premises and the [validity](#) of the logical relationships between the premises, any intermediate assertions and the conclusion. The main logical property of an argument that is of concern to us here is whether it is *truth preserving*, that is *if* the premises are true, *then* so is the conclusion. We will usually abbreviate this property by saying simply that argument is *valid*.

If the argument is valid, the premises together *entail* or *imply* the conclusion.

The ways in which arguments go wrong tend to fall into certain patterns, called [logical fallacies](#).

Validity is a semantic characteristic of arguments; independently of this property, and more controversially, arguments should also be *scrutinizable*, in the sense that the argument be open to public examination and *systematic* in the sense that the structural components of the argument have public legitimacy.

Causality

The [philosophical](#) concept of **causality**, the principles of causes, or **causation**, the working of causes, refers to the set of all particular "causal" or "cause-and-effect" relations. A neutral definition is notoriously hard to provide since every aspect of causation has received substantial debate. Most generally, causation is a relationship that holds between [events](#), [objects](#), [variables](#), or [states of affairs](#). It is usually presumed that the cause chronologically precedes the effect. Finally, the existence of a causal relationship generally suggests that - [all other things being equal](#) - if the cause occurs the effect will as well (or at least the [probability](#) of the effect occurring will increase).

In natural languages, causal relationships can be expressed by the following causative expressions: i) a set of causative verbs [*cause, make, create, do, effect, produce, occasion, perform, determine, influence; construct, compose, constitute; provoke, motivate, force, facilitate, induce, get, stimulate; begin, commence, initiate, institute, originate, start; prevent, keep, restrain, preclude, forbid, stop, cease*]; ii) a set of causative names [*actor, agent, author, creator, designer, former, originator; antecedent, causality, causation, condition, fountain,*

occasion, origin, power, precedent, reason, source, spring; reason, grounds, motive, need, impulse]; iii) a set of effective names [*consequence, creation, development, effect, end, event, fruit, impact, influence, issue, outcome, outgrowth, product, result, upshot*]. Causality is the centerpiece of the universe and so the main subject of [ontology](#); for comprehending the nature, meaning, kinds, varieties, and ordering of cause and effect amounts to knowing the beginnings and endings of things, to uncovering the implicit mechanisms of world dynamics, or to having the fundamental scientific knowledge.

Deductive Reasoning

In traditional [Aristotelian logic](#), **deductive reasoning** is [inference](#) in which the conclusion is of no greater generality than the premises, as opposed to [abductive](#) and [inductive](#) reasoning, where the conclusion is of greater generality than the premises. Other theories of logic define deductive reasoning as inference in which the conclusion is just as certain as the premises, as opposed to inductive reasoning, where the conclusion can have less certainty than the premises. In both approaches, the conclusion of a deductive inference is *necessitated* by the premises: the premises can't be true while the conclusion is false. (In Aristotelian logic, the premises in inductive reasoning can also be related in this way to the conclusion.)

Examples

Valid:

All men are mortal.
Socrates is a man.
Therefore Socrates is mortal.

The picture is above the desk.
The desk is above the floor.
Therefore the picture is above the floor.

E comes before F in the alphabet system
B and D comes before E
Thus BD comes before F

A man will die after a headshot
A man just got shot in the head
Therefore that man will die.

All birds have wings.
A cardinal is a bird.
Therefore a cardinal has wings.

Invalid:

Every criminal opposes the government.

Everyone in the opposition party opposes the government.
Therefore everyone in the opposition party is a criminal.

This is invalid because the premises fail to establish commonality between membership in the opposition party and being a criminal. This is the famous [fallacy of the undistributed middle](#).

Inductive Reasoning

Induction or **inductive reasoning**, sometimes called **inductive logic**, is the process of [reasoning](#) in which the premises of an argument support the conclusion but do not ensure it. It is used to ascribe [properties or relations](#) to [types](#) based on tokens (i.e., on one or a small number of observations or experiences); or to formulate [laws](#) based on limited observations of recurring [phenomenal](#) patterns. Induction is used, for example, in using specific propositions such as:

This ice is cold.
A billiard ball moves when struck with a cue.

...to infer general propositions such as:

All ice is cold.
There is no ice in the Sun.
For every action, there is an equal and opposite reaction.
Anything struck with a cue moves.

Strong induction

All observed crows are black.
therefore
All crows are black.

This exemplifies the nature of induction: inducing the universal from the particular. However, the conclusion is not certain. Unless we are certain that we have seen every crow – something that is impossible – there may be one of a different colour. (Being black may be added to the definition of a crow; but if two crow-like birds were to be identical except for their colour, one would become an instance of a black crow and the other a (rare) instance of, say, a blue crow – but both would still be regarded as crows.)

[\[edit\]](#)

Weak induction

I always hang pictures on nails.
therefore
All pictures hang from nails.

Assuming the first statement to be true, this example is built on the certainty that "I always hang pictures on nails" leading to the generalisation that "All pictures hang from nails". However, not all pictures are hung from nails; indeed, not all pictures are hung. Conclusions drawn in this manner are usually overgeneralisations.

Teenagers are given many speeding tickets.
therefore
All teenagers speed.

In this example, the premise is not built upon a certainty: not every speeding teenager observed has been given a ticket. Therefore the conclusion drawn cannot be the certainty it claims to be.

Inference

Inference is the act or process of deriving a [conclusion](#) based solely on what one already knows. The conclusion inferred from multiple observations is made by the process of [inductive reasoning](#). The conclusion may be [correct](#) or incorrect, and may be tested by additional observations. In contrast, the conclusion of a [valid deductive](#) inference is true if the premises are true. The conclusion is inferred using the process of [deductive reasoning](#). A valid deductive inference is never false. This is because the validity of a deductive inference is formal. The inferred conclusion of a valid deductive inference is necessarily true if the premises it is based on are true.

Logical Fallacies

In [philosophy](#), the term **logical fallacy** properly refers to a *formal fallacy*: a flaw in the structure of a [deductive argument](#) which renders the argument [invalid](#). However, it is often used more generally in informal discourse to mean an argument which is invalid for any reason, and thus encompasses *informal fallacies* – those which are invalid for reasons other than structural flaws, such as an error in the [premises](#) – as well as formal fallacies.

Recognizing fallacies in everyday arguments may be difficult since arguments are often embedded in [rhetorical](#) patterns that obscure the logical connections between statements. Informal fallacies may also exploit the [emotions](#) or intellectual or [psychological](#) weaknesses of the audience. Having the capability to recognize fallacies in arguments will hopefully reduce the likelihood of such an occurrence.

Material Fallacies

The classification of *material fallacies* widely adopted by modern logicians and based on that of Aristotle, *Organon* (*Sophistici elenchi*), is as follows:

[Fallacy of Accident](#). To argue erroneously from a general rule to a particular case, without proper regard to particular conditions that vitiates the application of the general rule; a [deductive](#) fallacy when an exception to the generalization is ignored.

For instance:

1. Cars should never exceed the speed limit
2. Police cars are cars
3. Therefore, police cars should never exceed the speed limit

As a matter of fact the rule, cars should never exceed the speed limit, is only a general rule and police cars may be a valid exception.

Additionally:

1. Cutting people with a knife is a crime.
2. Surgeons cut people with knives.
3. Surgeons are criminals.

It is easy to construct fallacious arguments by applying general statements to specific incidents that are obviously exceptions.

Converse Fallacy of Accident. To argue from a special case to a general rule; a deductive fallacy that can occur when an exception to a generalization is wrongly called for.

For example:

If we allow people with glaucoma to use medical marijuana then everyone should be allowed to use marijuana.

People who suffer from glaucoma are an exception to the general rule that does not overlap with everyone else.

Irrelevant Conclusion. It's the logical fallacy of presenting an argument that may in itself be valid, but which proves or supports a different proposition than the one it is purporting to prove or support. The fallacies are common in platform oratory, in which the speaker obscures the real issue by appealing to his audience on the grounds of

- o purely personal considerations
- o popular sentiment
- o fear
- o conventional propriety

Example:

Baseball player Mark McGwire just retired. Clearly, he deserves to be in the Hall of Fame. After all, he's such a nice guy, and he gives a lot of money to all sorts of charities. (*Friendliness and charity are not qualifications for induction into the Hall of Fame, therefore they do not support the conclusion.*)

[Begging the question](#). Consists in demonstrating a conclusion by means of premises that pre-suppose that conclusion; occurring in [deductive reasoning](#) in which the [proposition](#) to be [proved](#) is assumed implicitly or explicitly in one of the [premises](#).

Example

"Politicians cannot be trusted. Only an untrustworthy person would run for office. The fact that politicians are untrustworthy is proof of this, therefore, politicians cannot be trusted."

Such an argument is fallacious, because it relies upon its own proposition—in this case, "politicians are untrustworthy"—in order to support its central premise. The argument essentially "begs" the premise to prove itself.

[Fallacy of False Cause](#) or [Non Sequitur](#). The conclusion can be either true or false, but the argument is a fallacy because the conclusion **does not follow** from the premise. Any argument that takes the following form is a *non sequitur*:

1. If A then B. (e.g. If I am a cat then I am a mammal.)
2. B. (e.g. I am a mammal.)
3. Therefore, A. (Therefore, I am a cat.)

Even if the premises and conclusion are all true (see 1.5), the conclusion is not a necessary consequence of the premises. This sort of *non sequitur* is also called [affirming the consequent](#).

[Fallacy of Many Questions](#). Where several questions are improperly grouped in the form of one, and a direct categorical answer is demanded, e.g. if a prosecuting counsel asked the prisoner "What time was it when you met this man?" with the intention of eliciting the tacit admission that such a meeting had taken place.

Another example is the classic line, "Have you stopped beating your wife?" Whether the person asked answers yes or no, he will admit to having beaten his wife at some time in the past. Thus, that fact is *presupposed* by the question, and if it has not been agreed upon by the speakers before, the question is improper, and the fallacy of many questions has been committed.

Verbal Fallacies

Verbal fallacies are those in which a false conclusion is obtained by improper or ambiguous use of words. They are generally classified as follows.

[Equivocation](#) consists in employing the same word in two or more senses, e.g. in a [syllogism](#), the middle term being used in one sense in the major and another in the minor

premise, so that in fact there are four not three terms ("All fair things are honourable; This woman is fair; therefore this woman is honourable," the second "fair" being in reference to complexion).

[Amphibology](#) is the result of ambiguity of grammatical structure, e.g. of the position of the adverb "only" in careless writers ("He only said that," in which sentence, as experience shows, the adverb has been intended to qualify any one of the other three words). For example:

Teenagers shouldn't be allowed to drive. It's getting too dangerous on the streets.

From the above statement it could be interpreted that teenagers shouldn't drive because they will be in danger, or that they shouldn't drive as they are causing all the danger.

A better example might be 'If you think the waiters are impolite you should see the manager' or 'I once shot an elephant in my pyjamas'.

[Fallacy of Composition](#) is a species of Amphibology that results from the confused use of collective terms. e.g. "The angles of a triangle are less than two right angles" might refer to the angles separately or added together.

[Division](#), the converse of the preceding, which consists in employing the middle term distributively in the minor and collectively in the major premise.

Accent, which occurs only in speaking and consists of emphasizing the wrong word in a sentence. E.g., "He is a fairly good pianist," according to the emphasis on the words, may imply praise of a beginner's progress, or an expert's depreciation of a popular hero, or it may imply that the person in question is a deplorable violinist).

Figure of Speech, the confusion between the metaphorical and ordinary uses of a word or phrase.

Faulty Generalization

A faulty generalization, also known as an inductive fallacy, is any of several errors of inductive inference:

[Hasty generalization](#) is the fallacy of examining just one or very few examples or studying a single case, and generalizing that to be representative of the whole class of objects or phenomena.

The [overwhelming exception](#) is related to the hasty generalization, but working from the other end. It is a generalization which is accurate, but tags on a qualification which eliminates enough cases (as exceptions); that what remains is much less impressive than what the original statement might have led one to assume.

[Statistical special pleading](#) occurs when the interpretation of the relevant statistic is "massaged" by looking for ways to reclassify or requantify data from one portion of results, but not applying the same scrutiny to other categories.

[Biased sample](#). A biased sample is one that is falsely taken to be typical of a [population](#) from which it is drawn. Someone saying "Everyone liked that movie!" might not mention that the "everyone" was them and three of their friends, or a group of the star's fans.

[Misleading vividness](#) is a kind of hasty generalization that appeals to the senses.

Appeals

[Appeal to authority](#). An appeal to [authority](#) is a [logical fallacy](#): authorities can be wrong, both in their own field and in other fields; therefore referencing authority does not automatically imply truth. However, referencing authority may carry a high enough probability of truth that it would be correct to base decisions on it. *Example*. "If Aristotle said it was so, it is so".

[Appeal to emotion](#). A [logical fallacy](#) where a party relies on emotional issues or presents an emotional case for the purpose of establishing an argument. An appeal to emotion is a type of red herring and encompasses several logical fallacies, including:

- [Appeal to consequences](#)
- [Appeal to fear](#)
- [Appeal to pity](#)
- [Appeal to ridicule](#)
- [Appeal to spite](#)
- [Two wrongs make a right](#)
- [Wishful thinking](#)

[Appeal to the majority](#). a fallacious argument that concludes a proposition to be true because many or all people believe it; it alleges that "*If many believe so, it is so.*"

[Appeal to motive](#). A pattern of argument which consists in challenging a thesis by calling into question the motives of its proposer. A common occurrence in appeals to motive is that only the possibility of a motive (however small) is shown, without showing the motive actually existed or, if the motive did exist, that the motive played a role in forming the argument and its conclusion. Indeed, it is often assumed that the mere possibility of motive is evidence enough. *Example*. "The referee comes from the same place as (*a sports team*), so his refereeing was obviously biased towards them." In this case, the thesis consists of the referee's rulings.

[Appeal to novelty](#). A [logical fallacy](#) in which someone claims that his or her idea or proposal is correct or superior because it is new and modern. Some examples are "If you want to lose weight, your best bet is to follow the latest diet" and "The department will become more profitable because it has been reorganised."

Appeal to probability. A logical fallacy, often used in conjunction with other fallacies. It assumes that because something *could* happen, it is inevitable that it *will* happen. This is flawed logic, regardless of the likelihood of the event in question. The fallacy is often used to exploit paranoia. *Example.* "There are many hackers that use the internet. Therefore, if you use the internet without a firewall, it is inevitable that you will be hacked sooner or later."

Appeal to tradition. A common logical fallacy in which someone proclaims his or her accuracy by noting that "this is how it's always been done." Essentially: "This is right because we've always done it this way."

Appeal to force. Where force, coercion, or the *threat of force*, is given as a justification for a conclusion. One participates in this type of argument when one points out the dire consequences of holding a contrary position. *Example.* "*The Bible is true: if I rejected it, I would be punished.*"

Appeal to wealth. A logical fallacy of concluding that a statement is correct because the speaker is rich. *Example:* "If you're so smart, why aren't you rich?" or "I think Mary is a good role model. She's pretty rich so she must be doing something right."

Retrieved from "http://en.wikipedia.org/wiki/Faulty_generalization"