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LOGICAL ARGUMENTS

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Logic has been defined as the study of the rules of correct thinking. It concentrates on the principles that guide rational thought and discussion. The most fundamental concept in logic is that of an argument. An argument must be distinguished from "arguing", which is a debate or disagreement between different people. In logic, an argument is a set of one or more meaningful declarative sentences (or "propositions") known as the premises along with another meaningful declarative sentence (or "proposition") known as the conclusion. A deductive argument asserts that the truth of the conclusion is a logical consequence of the premises; an inductive argument asserts that the truth of the conclusion is supported by the premises. Deductive arguments are valid or invalid, and sound or not sound. An argument is valid if and only if the truth of the conclusion is a logical consequence of the premises and (consequently) its corresponding conditional is a necessary truth. A sound argument is a valid argument with true premises.

Each premise and the conclusion are only either true or false, i.e. are truth bearers. The sentences composing an argument are referred to as being either true or false, not as being valid or invalid; deductive arguments are referred to as being valid or invalid, not as being true or false. Some authors refer to the premises and conclusion using the terms declarative sentence, statement, proposition, sentence, or even indicative utterance. The reason for the variety is concern about the ontological significance of the terms, proposition in particular. Whichever term is used, each premise and the conclusion must be capable of being true or false and nothing else: they are truthbearers.

There are two traditional types of argument, deductive and inductive:

1) Inductive reasoning, also known as induction or inductive logic, is a type of reasoning that involves moving from a set of specific facts to a general conclusion. It uses premises from objects that have been examined to establish a conclusion about an object that has not been examined[1] It can also be seen as a form of theory-building, in which specific facts are used to create a theory that explains relationships between the facts and allows prediction of future knowledge. The premises of an inductive logical argument indicate some degree of support (inductive probability) for the conclusion but do not entail it; i.e. they do not ensure its truth. Induction is used to ascribe properties or relations to types based on an observation instance (i.e., on a number of observations or experiences); or to formulate laws based on limited observations of recurring phenomenal patterns. Induction is employed, for example, in using specific propositions such as:

This ice is cold. (Or: All ice I have ever touched has been cold.)

This billiard ball moves when struck with a cue. (Or: Of one hundred billiard balls struck with a cue, all of them moved.)

...to infer general propositions such as:

All ice is cold.

All billiard balls move when struck with a cue.

2) Deductive reasoning, also called Deductive logic, is reasoning which constructs or evaluates deductive arguments. In logic, an argument is deductive when its conclusion is a logical consequence of the premises. Deductive arguments are valid or invalid, never true or false. A deductive argument is valid if and only if the conclusion does follow necessarily from the premises. If the conclusion is false, then at least one of the premises must be false. And if a deductive argument is not valid then it is invalid. A valid deductive argument with true

premises is said to be sound; a deductive argument which is invalid or has one or more false premises or both is said to be not sound (unsound).

An example of a deductive argument and hence of deductive reasoning:

1.All men are mortal

2.Socrates is a man

3.(Therefore,) Socrates is mortal

The term validity in logic (also logical validity) is largely synonymous with logical truth, however the term is used in different contexts. Validity is a property of formulas, statements and arguments. A logically valid argument is one where the conclusion follows from the premises. An invalid argument is where the conclusion does not follow from the premises. A deductive argument may be valid but not sound. In other words, validity is a necessary condition for truth of a deductive syllogism but is not a sufficient condition.

An argument is valid if and only if the truth of its premises entails the truth of its conclusion. It would be self-contradictory to affirm the premises and deny the conclusion. The corresponding conditional of a valid argument is a logical truth and the negation of its corresponding conditional is a contradiction. The conclusion is a logical consequence of its premises.

An argument that is not valid is said to be "invalid".

An example of a valid argument is given by the following well-known syllogism:

All men are mortal.

Socrates is a man.

Therefore, Socrates is mortal.

What makes this a valid argument is not that it has true premises and a true conclusion, but the logical necessity of the conclusion, given the two premises: the argument would be just as valid were the premises and conclusion false. The following argument is of the same logical form but with false premises and a false conclusion, and it is equally valid:

All cups are green.

Socrates is a cup.

Therefore, Socrates is green.

No matter how the universe might be constructed, it could never be the case that these arguments should turn out to have simultaneously true premises but a false conclusion. The above arguments may be contrasted with the following invalid one:

All men are mortal.

Socrates is mortal.

Therefore, Socrates is a man.

In this case, the conclusion does not follow inescapably from the premises: a universe is easily imagined in which 'Socrates' is not a man but a woman, so that in fact the above premises would be true but the conclusion false. This possibility makes the argument invalid. (Although, whether or not an argument is valid does not depend on what anyone could actually imagine to be the case, this approach helps us evaluate some arguments.)

A standard view is that whether an argument is valid is a matter of the argument's logical form. Many techniques are employed by logicians to represent an argument's logical form. A simple example, applied to the above two illustrations, is the following: Let the letters 'P', 'Q', and 'S' stand, respectively, for the set of men, the set of mortals, and Socrates. Using these symbols, the first argument may be abbreviated as:

All P are Q.

S is a P.

Therefore, S is a Q.

Similarly, the second argument becomes:

All P are Q.

S is a Q.
Therefore, S is a P.

These abbreviations make plain the logical form of each respective argument. At this level, notice that we can talk about any arguments that may take on one or the other of the above two configurations, by replacing the letters P, Q and S by appropriate expressions. Of particular interest is the fact that we may exploit an argument's form to help discover whether or not the argument from which it has been obtained is or is not valid. To do this, we define an "interpretation" of the argument as an assignment of sets of objects to the upper-case letters in the argument form, and the assignment of a single individual member of a set to the lower-case letters of the argument form. Thus, letting P stand for the set of men, Q stand for the set of mortals, and S stand for Socrates is an interpretation of each of the above arguments. Using this terminology, we may give a formal analogue of the definition of deductive validity: *an argument is formally valid if its form is one such that for each interpretation under which the premises are all true also the conclusion is true.*

While arguments attempt to show that something is, will be, or should be the case, explanations try to show why or how something is or will be. If Fred and Joe address the issue of whether or not Fred's cat has fleas, Joe may state: "Fred, your cat has fleas. Observe the cat is scratching right now." Joe has made an argument that the cat has fleas. However, if Fred and Joe agree on the fact that the cat has fleas, they may further question why this is so and put forth an explanation: "The reason the cat has fleas is that the weather has been damp." The difference is that the attempt is not to settle whether or not some claim is true, it is to show why it is true.

In this sense, arguments aim to contribute knowledge, whereas explanations aim to contribute understanding.

Arguments and explanations largely resemble each other in rhetorical use. This is the cause of much difficulty in thinking critically about claims. There are several reasons for this difficulty.

- People often are not not themselves clear on whether they are arguing for or explaining something.
- The same types of words and phrases are used in presenting explanations and arguments.
- The terms 'explain' or 'explanation,' et cetera are frequently used in arguments.
- Explanations are often used within arguments and presented so as to serve *as arguments*.

A fallacy is an invalid argument that appears valid, or a valid argument with disguised assumptions. First the premises and the conclusion must be statements, capable of being true and false. Secondly it must be asserted that the conclusion follows from the premises. In English the words *therefore*, *so*, *because* and *hence* typically separate the premises from the conclusion of an argument, but this is not necessarily so.

Below is a list of some common fallacies, and also some rhetorical devices often used in debate. The list is not intended to be exhaustive.

Argumentum ad baculum / Appeal to force

The Appeal to Force is committed when the arguer resorts to force or the threat of force in order to try and push the acceptance of a conclusion. It is often used by politicians, and can be summarized as "might makes right". The force threatened need not be a direct threat from the arguer.

For example:

"... Thus there is ample proof of the truth of the Bible. All those who refuse to accept that truth will burn in Hell."

Argumentum ad misericordiam

This is the Appeal to Pity, also known as Special Pleading. The fallacy is committed when the arguer appeals to pity for the sake of getting a conclusion accepted. For example:

"I did not murder my mother and father with an axe. Please don't find me guilty; I'm suffering enough through being an orphan."

Argumentum ad populum

This is known as Appealing to the Gallery, or Appealing to the People. To commit this fallacy is to attempt to win acceptance of an assertion by appealing to a large group of people. This form of fallacy is often characterized by emotive language. For example:

"Pornography must be banned. It is violence against women."

"The Bible must be true. Millions of people know that it is. Are you trying to tell them that they are all mistaken fools?"

Argumentum ad numerum

This fallacy is closely related to the argumentum ad populum. It consists of asserting that the more people who support or believe a proposition, the more likely it is that that proposition is correct.

Equivocation / Fallacy of four terms

Equivocation occurs when a key word is used with two or more different meanings in the same argument. For example:

"What could be more affordable than free software? But to make sure that it remains free, that users can do what they like with it, we must place a license on it to make sure that will always be freely redistributable."

Personification / Reification / Hypostatization

If writers present abstractions as if they were concrete entities, then they are guilty of reification, also known as hypostatization. occurs when an abstract concept is treated as a concrete thing. A special case of this rhetorical gaff is personification, in which the abstraction is imagined to have human qualities.

"Nature doesn't like the way humans treat the environment."

Bifurcation / False Dilemma

Often referred to as the "either/or" fallacy, the writer tries to convince the reader to accept his/her proposition because s/he suggests that there are only two possibilities, one that is truly bad or the other less awful (the one likely to be favored by the writer). This is a false dilemma because usually other alternatives do exist but are not explored.

"Either you let me raise taxes, or I will have to lay off 100 police and fire fighters in order to balance the city's budget."

The way to avoid a false dilemma is to remember that often there are many different ways to resolve a problem, not just the two offered by the writer. In the example above, a city could raise revenues by increasing the taxes on gasoline, liquor, tobacco or by increasing the fees at its airports, harbor, parks, etc. We needn't think that the only alternatives are raising property taxes and lay offs.

Accent

If a writer attempts to change the meaning by changing the emphasis (the focus or the accent), the writer is committing a fallacy of reasoning. Accent is the attempt to persuade by shifting meaning and focus away from one issue to another issue. For example, compare:

"We should support those governments that support our policies."

"We should support those governments that support our policies."

Learning more about logic and arguments is really matter and really help anyone. The most immediate and obvious benefit from such a study is that it can allow you to improve the quality of the arguments you use. A second and closely related benefit will be an improved

ability to evaluate the arguments of others. A further benefit will also hopefully be an ability to communicate more clearly and effectively.