Deductive and Inductive Arguments

A *deductive argument* is an argument in which it is thought that the premises provide a *guarantee* of the truth of the conclusion. In a deductive argument, the premises are intended to provide support for the conclusion that is so strong that, if the premises are true, it would be *impossible* for the conclusion to be false.

An *inductive argument* is an argument in which it is thought that the premises provide reasons supporting the *probable* truth of the conclusion. In an inductive argument, the premises are intended only to be so strong that, if they are true, then it is *unlikely* that the conclusion is false.

The difference between the two comes from the *sort of relation* the author or expositor of the argument takes there to be between the premises and the conclusion. If the author of the argument believes that the truth of the premises *definitely establishes* the truth of the conclusion due to definition, logical entailment or mathematical necessity, then the argument is *deductive*. If the author of the argument does not think that the truth of the premises definitely establishes the truth of the conclusion, but nonetheless believes that their truth provides good reason to believe the conclusion true, then the argument is *inductive*.

The noun "deduction" refers to the process of advancing a deductive argument, or going through a process of reasoning that can be reconstructed as a deductive argument. "Induction" refers to the process of advancing an inductive argument, or making use of reasoning that can be reconstructed as an inductive argument.

Because deductive arguments are those in which the truth of the conclusion is thought to be completely *guaranteed* and not just *made probable* by the truth of the premises, if the argument is a sound one, the truth of the conclusion is "contained within" the truth of the premises; i.e., the conclusion does not go beyond what the truth of the premises implicitly requires. For this reason, deductive arguments are usually limited to inferences that follow from definitions, mathematics and rules of formal logic. For example, the following are deductive arguments:

- There are 32 books on the top-shelf of the bookcase, and 12 on the lower shelf of the bookcase. There are no books anywhere else in my bookcase. Therefore, there are 44 books in the bookcase.
- Bergen is either in Norway or Sweden. If Bergen is in Norway, then Bergen is in Scandinavia. If Bergen is in Sweden, then Bergen is in Scandinavia. Therefore, Bergen is in Scandinavia.

Inductive arguments, on the other hand, can appeal to any consideration that might be thought relevant to the probability of the truth of the conclusion. Inductive arguments, therefore, can take very wide ranging forms, including arguments dealing with statistical data, generalizations from past experience, appeals to signs, evidence or authority, and causal relationships.

Some dictionaries define "deduction" as *reasoning from the general to specific* and "induction" as *reasoning from the specific to the general*. While this usage is still sometimes found even in philosophical and mathematical contexts, for the most part, it is outdated. For example, according to the more modern definitions given above, the following argument, even though it reasons from the specific to general, is *deductive*, because the truth of the premises *guarantees* the truth of the conclusion:

The members of the Williams family are Susan, Nathan and Alexander.
Susan wears glasses.
Nathan wears glasses.
Alexander wears glasses.
Therefore, *all* members of the Williams family wear glasses.

Moreover, the following argument, even though it reasons from the general to specific, is *inductive*:

It has snowed in Massachusetts *every* December in recorded history.
Therefore, it will snow in Massachusetts this coming December.

Mathematical Premises

It is worth noting, therefore, that the proof technique used in mathematics called "mathematical induction", is, according to the contemporary definition given above, actually a form of *deduction*. Proofs that make use of mathematical induction typically take the following form:

Property P is true of the number 0.
For all natural numbers *n*, if P holds of *n* then P also holds of *n* + 1.
Therefore, P is true of *all* natural numbers.

When such a proof is given by a mathematician, it is thought that if the premises are true, then the conclusion follows necessarily. Therefore, such an argument is deductive by contemporary standards.

Because the difference between inductive and deductive arguments involves the strength of evidence which the author *believes* the premises to provide for the conclusion, inductive and deductive arguments differ with regard to the standards of evaluation that are applicable to them. The difference does not have to do with the content or subject matter of the argument. Indeed, the same utterance may be used to present either a deductive or an inductive argument, depending on the intentions of the person advancing it. Consider as an example.

Dom Perignon is a champagne, so it must be made in France.

It might be clear from context that the speaker believes that having been made in the Champagne area of France is part of the defining feature of "champagne" proper and therefore the conclusion follows from the premise by definition. If it is the intention of the speaker that the evidence is of this sort, then the argument is deductive. However, it may be that no such thought is in the speaker's mind. He or she may merely believe that most champagne is made in France, and may be reasoning probabilistically. If this is his or her intention, then the argument is inductive.

It is also worth noting that, at its core, the distinction has to do with the strength of the justification that the author or expositor of the argument *intends* that the premises provide for the conclusion. If the argument is logically fallacious, it may be that the premises *actually* do not provide justification of that strength, or even any justification at all. Consider, the following argument:

All odd numbers are integers.
All even numbers are integers.
Therefore, all odd numbers are even numbers.

This argument is logically invalid. In actuality, the premises provide *no support whatever* for the conclusion. However, if this argument were ever seriously advanced, we must assume that the author would *believe* that the truth of the premises guarantees the truth of the conclusion. Therefore, this argument is still deductive. A bad deductive argument is not an inductive argument.