

An Overview of Arguments in Logic

An *argument* is a set of statements one of which (the *conclusion*) is taken to be supported by the remaining statements (the *premises*). [Note that a “statement” can either consist in a whole sentence, or an independent clause within a sentence, or an ellipsis of either.]

Five types of Arguments: **Inductive, Deductive, Abductive, Practical, and Other.**

An **Inductive** argument is an argument where the premises describe some cases of a certain phenomenon, and the conclusion says that further cases will be like those cases.

Examples:

- | | |
|---|--|
| (P1) The sun rose today. | (P1) Everyone in my family has been stung by a bee. |
| (P2) The sun rose yesterday. | (C) So, absolutely everyone has been stung by a bee. |
| (P3) The sun rose the day before
yesterday. | |
| (P4) The sun rose the day before
the day before yesterday.
[etc.] | |
| (C1) So, the sun will rise tomorrow. | |

Of course, the premises in each argument do not *guarantee* the truth of the conclusion. Still, an argument can be a **good inductive argument** to the degree that the conclusion is **likely** given the premise(s).

A **Deductive** argument, on the other hand, *does* guarantee the truth of the conclusion, when the premises are all true.

Official Definition: An argument is **deductive** if and only if [abbreviation: “iff”] it is not possible for the premise(s) to be true and the conclusion false.

Example of a deductive argument:

- (P1) Jim likes either Coke or Pepsi.
- (P2) Jim does not like Pepsi.
- (C) So, Jim likes Coke.

So with a deductive argument, if we get you to accept the premises, then you *must accept the conclusion too*. Why? ‘Cause in a deductive argument there’s no way for both the premises to be true and the conclusion false.

Unfortunately, most of the time a deductive argument is called (misleadingly) a ‘valid argument’. The label is misleading, since you can have a “valid” argument which is nonetheless a bad argument, all things considered. That’s because the premises might be

totally implausible. Yet the argument still counts as “valid” if it is the kind of argument where *if* you granted the premises, the conclusion *would* be guaranteed.

So if you hear a logician call an argument “valid,” that does not mean that it is ultimately a good argument. Conversely, if an argument is “invalid,” that does not mean it is a bad argument! All *inductive* arguments are invalid, technically speaking, i.e., they are non-deductive. Still, as we saw, there can be *good* inductive arguments. Thus, if you say that an argument is “invalid,” you’re saying that the premises do not *guarantee* the conclusion. Though the premises may still make the conclusion very *likely* for all that.

The term ‘valid’ is also misleading in that “validity” concerns a *relationship* between premise(s) and conclusion. It is NOT directly concerned the *actual truth* of the statements in the argument. This is contrary to how we use the word ‘valid’ outside the logic classroom: Ordinarily, we sometimes say that someone has made a “valid point” or that someone’s perspective is “valid” when we mean that s/he made a true statement. But this is NOT how logicians use ‘valid’—they say only that *arguments* are “valid.” (Consequently, logicians do not speak of a point or a perspective as “valid;” they say instead that someone has a good point or has a legitimate perspective, etc.)

Of course, not every argument is deductive (= valid). Here’s one example:

- (P1) Jim likes either Coke or Pepsi.
- (P2) Jim does not like Mountain Dew.
- (C) So, Jim likes Coke.

In this, it is possible for the premises to be true, and the conclusion false. That’s not to say the premises are *actually* true or the conclusion is *actually* false. Rather, it’s just to say that this combination of truth and falsity is *possible*. N.B., A non-deductive (= invalid) argument is also sometimes called a *non-sequitur*—it is an argument where the conclusion is “does not follow” from the premise(s).

Some deductive arguments are also SOUND: An argument is *sound* iff it is BOTH deductive AND has only true premises. Thus, an argument is *unsound* iff it is not deductive or some premise is false.

So, to check that an argument is sound, you have to verify that the argument is deductive and that *every* premise is true.

Example of a sound argument:

- (P1) If a thing is a rectangle, then it’s not a circle.
- (P2) This page is a rectangle.
- (C) So, this page is not a circle.

This argument is sound, since it is deductive, and all of its premises are true.

Example of an unsound argument:

- (P1) If Bill Gates is poor, then I'm a monkey's uncle.
(P2) Bill Gates is poor.
(C) So I'm a monkey's uncle.

This argument is unsound: Although it is deductive, it is not true that Bill Gates is poor.

NOTE: Truth and Falsity are NOT properties of *arguments*, but of *statements*. Thus, we do not say that a deductive argument is “true;” rather, we can say that it is deductive or that it is sound. Or, if we want to talk of “true” and “false,” we can evaluate the *statements in the argument* as true or false.

An **Abductive** argument is an argument that is neither deductive nor inductive, where the conclusion stands as an *explanation* of the collection of facts given in the premises.

Examples:

- | | |
|--|------------------------------|
| (P1) I can't get online from my computer. | (P1) I have a headache. |
| (P2) There's nothing wrong with my hardware or software. | (C) So, my head is shrinking |
| (C) So, the University network must be down. | |

Now the first example may not seem abductive, since the conclusion does not explain (P2). (Whether the network is down seems irrelevant to whether my hardware/software is working.) However, the definition of abduction requires only that the *collective* of facts is explained by the conclusion. So the question is not whether the conclusion explains each premise *individually*; rather, it is whether the conclusion explains why the premises are true *together*, true *all at the same time*.

Consequently, the first example is indeed abductive, but this does not depend on whether the conclusion explains (P1) in isolation, or on whether it explains (P2) in isolation. Rather, the argument counts as abductive because the conclusion explains why (P1) and (P2) are *jointly* true: It explains not just why I can't get online, but why I can't get online *despite my functioning hardware/software*.

Confusingly, however, some *inductive* and *deductive* arguments also have conclusions which, in some sense, explain facts given in the premises. The second example of an **inductive** argument [above] has an “explanatory” conclusion in a way. Further, the conclusion is also “explanatory” in the following *deductive* argument:

- (P1) This figure is a triangle.
(C) Hence, this figure is a closed, three-sided figure.

After all, if the figure is a closed three-sided figure, that “explains” why it is a triangle. But still, the argument is deductive and NOT abductive, because the truth of the premise would *guarantee* that the conclusion is true. That fact trumps all.

Thus, in order to tell whether an argument is abductive, you must FIRST discern that the argument is *neither deductive nor inductive*.

Like an inductive argument, however, an abductive argument is a **good abductive argument** to the degree that the conclusion is *likely* given the premise(s). (Since abduction and induction are both evaluated by the probability of the conclusion, sometimes logic books call both “induction.”) What’s more, if the conclusion of an abductive argument is the *most likely* explanation out of all the explanations available, then the abductive argument is sometimes called an *inference to the best explanation*.

A **Practical** argument is an argument where the conclusion is a statement of what *should* or *ought to* be done, yet the argument is not deductive, nor inductive, and nor abductive.

Examples:

(P1) Stocks are low right now	(P1) I need to make money.
(P2) The economy will recover soon.	(P2) Kidnapping children makes money.
(C) So, I should buy stocks right now.	(C) So, I should start kidnapping children.

As should be clear, these two arguments are not deductive. Re: the first example, even if stocks are low and the economy is expected to recover, it’s still possible that I should refrain from buying stocks. (Maybe I have barely enough money to feed my family.)

Yet the first example *can* be a good practical argument if I have expendable income. Regardless, it remains *possible* for the premise to be true and the conclusion false (for different reasons). So even then, the argument remains non-deductive.

When is a practical argument a **good practical argument**? NOBODY KNOWS. That is debated vigorously among ethicists. Though there is a sub-type of practical argument, a decision-theoretic argument, and it *is* known what makes these arguments good or bad (under certain assumptions). Very briefly, you have a good decision-theoretic argument when the conclusion recommends an action that is expected to “maximize profit” among the available options. (No need to go into more detail at this point...)

Note: Some arguments with a “should” or “ought to” conclusion are NOT practical arguments. Consider the following inductive and deductive arguments (respectively):

(P1) I shouldn’t have played the lottery today.	(P1) Thou shalt not steal.
(P2) I shouldn’t have played the lottery yesterday.	(C) I should not steal this ipod.
(P3) I shouldn’t have played the lottery the day before that.	
[etc.]	
(C) I shouldn’t play the lottery tomorrow.	

(Plausibly, there are abductive arguments with “should” or “ought to” conclusions as well.) So remember that the term ‘practical argument’ is reserved for an argument that is NOT any of the previous three types (plus, it has a “should” or “ought to” conclusion).

Other arguments exist besides the four types already listed. Some arguments in the “other” category are “mixtures.” Consider, for instance:

- (P1) My car is usually out of gas.
- (P2) My car currently isn't running.
- (C) So, my car is currently out of gas.

The argument can appear to be inductively *and* abductively supported. Consider that if the argument just consisted of (P1) and (C), it would be inductive. Or if the argument just consisted of (P2) and (C), then it would look abductive. Yet since you've got both premises, it is *neither* inductive nor abductive. (Check the definitions of 'inductive' and 'abductive' to see why.)

A different kind of “other” argument is an *enthymeme*: In these arguments, too much is left out to say more precisely what type of argument it is. For instance:

- (P1) The Democrats took control of the Congress and the White House.
- (C) So, predictably, the economy stopped its downward slide.

How exactly is (C) supported by (P1) in this case? Are we making an induction based on past cases (which aren't explicitly mentioned)? Or are we *deducing* the conclusion from a suppressed premise like “whenever the Democrats are in control, the economy improves”? It's impossible to say in this case. So we put it in the “other” category.

Relatedly, some arguments can't be classified more precisely, simply because they are *just a mess*. Consider:

- (P1) I have ten toes.
- (P2) Penguins live in Antarctica.
- (C) So, Obama's economic plan will fail.

Observe that out of context, these three sentences would not seem to be an *argument* at all. But here, they indeed constitute an argument since one statement is marked as the conclusion (and other statements are marked as premises). So in this case, the three statements *are* an argument; it's just that it's a *really bad* argument. Because of that, it's not at all clear how the premises are meant to support the conclusion; hence, the argument goes in the “other” category.

Finally, some arguments in the “other” category are *arguments by analogy*. These are arguments that start from a similarity or analogy between two things. It then concludes that what's true of one is true of the other. Here's a famous example:

- (P1) A watch has a designer.
- (P2) Our universe is like a watch.
- (C) So, our universe has a designer.

This goes in the “other” category because it doesn’t qualify as any of the other types:

- The truth of the premises would not guarantee the conclusion. Hence, the argument is not deductive.
- The premises do not list known cases where universes have designers—so it’s not inductive.
- The conclusion is not meant to explain why the premises are jointly true; it is therefore not abductive.
- Finally, the conclusion is not a “should” or “ought” conclusion. Thus it’s not a practical argument either.

Some logic books, however, classify arguments by analogy as *inductive*. (I myself think this is backwards. An inductive argument is a type of argument by analogy; it assumes that the unknown cases are *like* the known cases.) Regardless, when logicians speak of induction, they normally do not have analogical reasoning in mind. (And conversely, they are not thinking of induction when they talk of analogical reasoning.)

Unlike the just-plain-awful arguments, it is not *obvious* whether the watch-argument (for example) is a bad argument. It would depend on how appropriate the analogy is—i.e., whether the universe is similar *in the right way* to a watch. I’ll let the theologians among you decide that one. But generally, an argument by analogy is a good argument to the extent that the analogy is a “tight” one (to put it roughly).