LOGICAL TOOLKIT

Logic and Philosophy

Philosophy is very much about asking questions. Does God exist? What can we know? What keeps us the same through time and change? Is the mind distinct from the body? How do we know what is right and what is wrong? Because not everyone is going to agree on the correct answers to these questions, it is extremely important to give *reasons* why you think one answer is better than another. In giving reasons why you believe (or why others should believe) a particular answer, you are doing logic, even though you might not recognize it as such. Logic is just a way of articulating more clearly the reasoning that we ordinarily do when we tell someone why we believe something.

If we are to be persuaded that your position is correct, we need to have some way of assessing the reasons that you give for believing your position. For instance, we need to know whether your reasons really do lend support to the position. This is where learning a bit of logical apparatus can come in quite handy. So let's introduce some terminology.

Arguments

We'll start with the basic idea of an *argument*. As we use the term in philosophy, an argument is not just a verbal dispute about some matter. Rather, it is a way of articulating reasons. Or, to be more precise:

> An *argument* is a series of statements where the last statement supposedly *follows from* or *is supported by* the first statements. The last statement is called the *conclusion*, and the first statements are called the *premises*.

Here's a relatively simple example:

1. Everyone who lives in Los Angeles lives in California.
2. Alvin lives in Los Angeles.
3. Therefore, Alvin lives in California.

Suppose we were trying to convince you that our friend Alvin lives in California. (Again, we probably wouldn't normally give you an argument to convince you of this, but this is a simple example just to get the idea of an argument under our belts.) We might give you the following reasons for believing that Alvin lives in California. First, we know that Alvin lives in Los Angeles. And second, we know that Los Angeles is in California, so anyone who lives in Los Angeles automatically lives in California. These two reasons are represented by premises 1 and 2, and they are meant to support the conclusion, which is number 3. Arguments in the articles that you read for class will most often not appear in this numbered form, but they can all be reconstructed in this form so that the reasoning is easy to see.

In this example, if you were to accept the two premises, you would have to accept the conclusion. So our argument is, in a certain sense, a *good* argument. But there are different ways that an argument can be good.

Validity

The first way an argument can be good is if its premises actually do support its conclusion. Recall that our definition of an argument is a series of statements in which the conclusion *supposedly* follows from or is supported by the premises. Well, there are some arguments with conclusions that actually do follow from the premises, and there are some arguments with conclusions that don't actually follow from the premises, even though they *supposedly* do. The first type of arguments are *valid* arguments, and the second type are *invalid* arguments. Or, a bit more carefully:

> An argument is *valid* if its conclusion follows from its premises.

Or, more carefully still:

> An argument is *valid* if it satisfies the following condition: If its premises were true, then its conclusion would *have to be* true.

The argument we gave previously is an example of a valid argument because if premises 1 and 2 were true, then 3 would have to be true. But the following is an example of an *invalid* argument:

1. Everyone who lives in Los Angeles lives in California.
2. Alvin lives in California.
3. Therefore, Alvin lives in Los Angeles.

If we were to put forth this argument while trying to convince you that our friend Alvin lives in Los Angeles, you shouldn't be convinced. Why not? Simply because the reasons that we gave for believing that Alvin lives in Los Angeles don't actually support that conclusion. For in this case, premise 1 could be true (it actually is true), and premise 2 could be true, but the conclusion might still be false (Alvin could live in San Francisco, for instance). Thus this is an *invalid* argument. The conclusion doesn't actually follow from the premises. It's not the case that if its premises were true, then its conclusion would have to be true.

In philosophy, as in life, we're mostly interested in putting forth valid arguments. At the very least, our conclusions must really follow from our premises. But although validity is a good first step, it's not the only way that an argument can be good.

Soundness

If we succeed in putting forth a valid argument, that's a good start. But we want more from our arguments. We also want our premises to actually be true. Recall that validity was about the *relationship* between premises and conclusion: If the premises were true, then the conclusion would have to be true. But sometimes that's a big "if." That is, sometimes we're not sure whether the premises are actually true. That's the next thing we care about. If our argument is valid and its premises are also true, then the argument is *sound*. More precisely:

> An argument is *sound* if it is valid and has all true premises.

Or, more precisely still:

> An argument is *sound* if it satisfies the following two conditions:
>
> 1. It is valid.
> 2. All of its premises are true.

Let us give another example to understand soundness better. Consider the following argument:

1. Abortion is the killing of an innocent person.
2. Killing innocent people is morally objectionable.
3. Therefore, abortion is morally objectionable.

This is a much more interesting argument than the one we gave about our friend Alvin. Indeed, it is likely to stir emotions. But we're not going to discuss the moral rightness or wrongness of abortion—we're just using this argument as an example so that we can better understand logic. Now, there are at least two ways that an argument can be good, so whenever you are confronted with an argument such as this, you should always ask yourselves two questions: First, is it valid? Second, is it sound?

We'll save you the suspense: This argument is indeed valid. Remember what that means, though. It doesn't mean that abortion is morally objectionable.

All it means is that the premises of this argument really do support the conclusion of the argument. Or, in other words, *if* the premises were true, then the conclusion would have to be true. Whether this argument is valid is not a matter of controversy. What *is* a matter of controversy, however, is whether this argument is sound. That is, is it a valid argument with premises that are actually true? This is where opinions differ. For our purposes, it's enough to realize that if the premises of this argument actually are true, then the argument is sound (because it's also valid), and if the premises of this argument actually are false, then the argument is unsound (even though it's still valid).

Why do we care about putting forth sound arguments? Well, if you present someone with a valid argument and you can successfully argue that the premises of your argument are true, then the other person *must* accept the conclusion as well, on pain of irrationality. Because valid arguments are such that their conclusions really do follow from their premises, one cannot accept their premises without also accepting their conclusions. So if you are giving us your reasons for, say, your belief in God, and you present us with a valid argument with premises with which we agree, then we must agree that God exists. Logic can be a very powerful tool.

Persuasiveness

Although typically soundness is the ultimate goal for an argument, occasionally that's not enough. For purposes of illustration, suppose that you believe in God and your belief is actually true and you present an atheist with the following argument for God's existence:

1. God exists.
2. Therefore, God exists.

Given our supposition that God actually does exist, this argument is a sound argument. First, it's valid because its conclusion actually does follow from its premise. If the premise were true, then the conclusion would have to be true (because they are identical!). Second, again, given our supposition that God exists, the premise of this argument is true. So it looks like the argument is sound. But you're never going to convince your atheist friend to believe in God on the basis of this argument. Why not? Because it's utterly unpersuasive. Although it is sound, it commits a logical fallacy, namely, it's *circular*. An argument is circular if its conclusion appears somewhere within its premises. The reason why no one should be persuaded by a circular argument is that one would have to *already* accept the conclusion of the argument *before* one accepted the premises. This gets things backward. Those who already accept the conclusion will not need the argument to be persuaded, and those who do not already accept the conclusion have been given no reason to accept the premise. A similar, although more subtle, example is the following argument:

1. The Bible says that God exists.
2. Everything the Bible says is true.
3. Therefore, God exists.

Suppose again that God does in fact exist, the Bible says this, and everything the Bible says is true. Given these suppositions, this is a sound argument. But it's utterly unpersuasive because one would need to accept its conclusion before one accepted premise 2. This is a logical fallacy related to circularity often called *begging the question*. An argument begs the question if one or more of its premises relies for its truth on the truth of the conclusion.

So although validity and soundness are virtues of arguments, you have to be wary that your arguments are not flawed in some other way, such as by being circular.

Other Fallacies

It's not always easy to figure out whether a particular bit of reasoning is valid. In fact, there are some bits of reasoning that *seem* to be valid even though they are not. It will be useful to give a couple of examples of this phenomenon. A common fallacy of this sort is called *affirming the consequent*, illustrated by the following example:

1. If Amelia can vote in the United States, then Amelia is 18 years old.
2. Amelia is 18 years old.
3. Therefore, Amelia can vote in the United States.

The first premise of this argument is a *conditional*—that is, it is an "if . . . then" statement. The "if" part of a conditional is called the *antecedent*, and the "then" part of a conditional is called the *consequent*. Notice that premise 2 asserts the truth of the consequent of the conditional in premise 1, and then the argument concludes that the antecedent is therefore true. This is why this is called affirming the consequent, and it is an invalid form of reasoning. It's probably not too difficult to see in this simple example that even if premises 1 and 2 are true, the conclusion may still be false. Just imagine a situation in which Amelia is 18 years old but is not a citizen of the United States. In that case, it would still be true that if she can vote in the United States, she is 18 years old, and it would be true that she is 18 years old, but it would not be true that she can vote in the United States. Any argument that takes this form—a conditional, the consequent affirmed, and then the antecedent as conclusion—is invalid.

A related fallacy is *denying the antecedent*. Knowing what we know about conditionals, you can probably guess what this will look like:

1. If Amelia can vote in the United States, then she is 18 years old.
2. Amelia cannot vote in the United States.
3. Therefore, Amelia is not 18 years old.

Again, we have a conditional in the first premise, but in this case the second premise is a denial of the antecedent. The argument then concludes that the consequent must be false as well. But as in the previous case, this is a fallacious form of reasoning. Again, imagine a situation in which Amelia is 18 years old but is not a citizen of the United States. In that case, it would still be true that if she can vote in the United States, she is 18 years old, and it would be true that she cannot vote in the United States, but it would not be true that she is not 18 years old. And again, any argument that takes this form—a conditional, the antecedent denied, and then the consequent denied as a conclusion—is invalid.

These two invalid bits of reasoning *seem* valid because they closely resemble two bits of reasoning that *are* valid. These are *affirming the antecedent* and *denying the consequent*, and they are illustrated by the following two arguments:

1. If Amelia can vote in the United States, then she is 18 years old.
2. Amelia can vote in the United States.
3. Therefore, Amelia is 18 years old.

1. If Amelia can vote in the United States, then she is 18 years old.
2. Amelia is not 18 years old.
3. Therefore, Amelia cannot vote in the United States.

These are both valid forms of reasoning. In both arguments, if premises 1 and 2 were true, then the conclusion would have to be true. As you can see, it's important not to confuse these two bits of valid reasoning with the fallacious reasoning involved in affirming the consequent and denying the antecedent.

Necessary and Sufficient Conditions

So much for arguments. Another important logical concept is that of necessary and sufficient conditions. The best way to get a handle on these concepts is through an example. So consider the following statement:

> If you are a sophomore, then you are an undergraduate.

This statement is saying that being a sophomore is *sufficient* for being an undergraduate. In other words, *all* you need to be an undergraduate is to be a sophomore. (But that's not to say that's the *only* way to be an undergraduate.) In general, a statement of the form:

> *If X, then Y*

is a statement that X is a sufficient condition for Y. Now consider the following statement:

> If you can vote in the United States, then you are at least 18 years old.

This statement is saying that being at least 18 years old is *necessary* for being able to vote in the United States. In other words, one of the requirements for being able to vote in the United States is that you must be at least 18 years old. (But that's not to say that that is the *only* requirement.) In general, a statement of the form:

> *If X, then Y*

is a statement that *Y* is a necessary condition for *X*. Occasionally you will come across a statement that purports to give both necessary and sufficient conditions for something. For example:

> You have a sister if and only if you have a female sibling.

This statement says the same thing as the following two statements combined:

> If you have a sister, then you have a female sibling.
> If you have a female sibling, then you have a sister.

Or, in the language of necessary and sufficient conditions:

> Having a sister is necessary and sufficient for having a female sibling.

Philosophers are often interested in the necessary and sufficient conditions for some interesting concept, such as knowledge. An interesting philosophical question is: What are the necessary and sufficient conditions for the claim that you have knowledge about some fact? Certainly it is necessary that what you think you know must actually be true for you to know it. But is that also sufficient? Probably not, as you may believe something is true even though you don't have any good reason to believe it, and so on.

A Priori and A Posteriori

It will be useful to have a few more pieces of philosophical terminology at our disposal. First, philosophers often distinguish between *a priori* and *a posteriori*. These are Latin terms that are especially useful in describing the way in which we are able to come to know certain propositions. Propositions that can be known a priori are those that can be known completely independent of experience. They are those propositions that we can know, so to speak, "from the armchair." For example, our knowledge that all triangles have three sides is a piece of a priori knowledge. There's no need to go around the world looking for triangles and counting up their sides to conclude that all triangles have three sides. On the other hand, propositions that can be known a posteriori are those that require experience of the world to come to know. For example, your knowledge that it is raining outside right now is a posteriori knowledge. To determine whether it is raining, you need to open your eyes and look at the world. No amount of armchair speculation will help.

Necessary and Contingent

Another distinction that comes in handy in philosophy is one between *necessary* and *contingent* truths. A necessary truth is a proposition that is true and could not have been false, whereas a contingent truth is a proposition that is true but might have been false. Most of the true propositions we ordinarily come across are contingent propositions. For instance, the fact that you are reading this right now is a contingent truth. You could very well have decided to do something else with your time. Even the fact that you exist is a contingent truth. Had your parents not met when they did, you could very well have never been born. In fact, we are so surrounded by contingent truths that it's difficult to think of an uncontroversial necessary truth. An example would be the fact that all triangles have three sides. No matter how the world could have been, triangles would always have had three sides—that statement could not have been false. Of course, we could have used the word "triangle" to talk about four-sided figures, but that's not to say that triangles could have been four-sided figures. The concept of a triangle is so intimately connected up with the concept of three-sidedness that it's impossible to have one without the other. Another example is the fact that all bachelors are unmarried. This is a necessary truth because no matter how the world could have been, bachelors would have always been unmarried.

Although these terms are most often used to talk about true and false propositions, they are also sometimes used to distinguish between necessary and contingent *existence*. You and I exist only contingently—that is, we might not have existed. God, on many interpretations, is supposed to exist necessarily—that is, God could not have *not* existed.