24.09x Guide to Logic and Argumentation

An *argument* in logic is not a quarrel or dispute; instead, it is a list of sentences.[1] The last sentence is the *conclusion*, and the other sentences are the *premises*. The premises are sometimes separated from the conclusion by a line. Thus:

(1) No professors are ignorant.
All ignorant people are vain.
―――――――――――――
No professors are vain.

and:

(2) All lions are fierce.
Some lions do not drink coffee.
―――――――――――――
Some creatures that drink coffee are not fierce.

are both arguments. (These two examples are taken from Lewis Carroll, who was a mathematician and logician, as well as the author of *Alice in Wonderland*.) The readings will usually not contain arguments in this nice form. Rather, you will have to extract premises and conclusions from much more complex and lengthy passages of text. In doing this, it is helpful to look out for certain key words which often serve as indicators of ("flags for") premises or conclusions.

Some common premise-indicators are **because, since, given that, for**. These words usually come right *before* a premise. Here are some examples of the use of such flags for premises:

(3) Mr. Toad should be imprisoned, **because** he stole a motor car.
(4) **Given that** keeping pet dragons is a common practice, we might as well make it legal.
(5) **Since** cockroach clusters are disgusting sweets, they should not be sold to children.
(6) We must occupy Dumbledore's office, **for** house-elves are enslaved.
(7) **Because** the existence of the Gruffalo is hotly contested, nobody should force her opinion about it on anyone else.

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[1] More exactly, sentences that are either true or false. Thus "Shut the door!", and "Is the door shut?", although perfectly acceptable sentences, cannot form part of an argument as explained here. (*Propositions* are alternative candidates for premises and conclusions—see the Glossary entries **Argument** and **Proposition**.)

Some common conclusion-indicators are **thus, therefore, hence, it follows that, so, consequently**. These words usually come right *before* the conclusion of the argument.

Here are some examples of the use of such flags for conclusions:

(8) Either Snape lied to Voldemort, or to Dumbledore, or to Hagrid; **so** he lied to someone.

(9) Affirmative action for plain-belly Sneetches violates the rights of star-belly Sneetches to a fair shake; **hence** it is unjust.

(10) It is wrong to destroy the environment, and the Once-ler is chopping down Truffula trees. **It follows that** the Once-ler is acting wrongly.

(11) Harry Potter is a wizard of impeccable integrity and would never lie. **Consequently**, he was wrongly accused.

(12) Mr. Toad has crashed another motor car and **so** has taken leave of his senses. **Thus**, reasoning with him is pointless and he should **therefore** be locked in his bedroom.

It is also helpful to use these premise- and conclusion-indicators in your own writing, whether on the forum for this course or elsewhere, to make the structure of your arguments clearer. Don't use them lightly, however: make sure they really are "flagging" either a premise or a conclusion of your argument, as appropriate. A reader is entitled to think that sentences preceded by **because**, etc., are premises, and that sentences preceded by **therefore**, etc., are conclusions.

Evaluating arguments

Definitions:

A conclusion *is entailed by* (or *is a logical consequence of*, or *logically follows from*) some premises just in case it is *absolutely impossssible* for all the premises to be true and the conclusion false. Put another way, the conclusion is entailed by the premises just in case, necessarily, if the premises are all true, the conclusion is true.[2]

An argument is *valid* just in case its conclusion is entailed by its premises.

An argument that is not valid is *invalid*.

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[2] At any rate, this will do for our purposes; if you want to read about some complications, see the *Stanford Encyclopedia* entry on Logical Consequence.

Note that there are perfectly good arguments (in the sense that if you *were* to know that the premises are true, you *would* have good reason to believe that the conclusion is true) that are nonetheless invalid. For example:

(13) Past Wizards' Congresses have always contained many adulterers.
 ____
 The current Wizards' Congress contains some adulterers.

(14) We have examined a large random sample of rats, and found that they enjoy messing about in boats.
 ____
 Most rats enjoy messing about in boats.

Such arguments are called *inductively strong*. (*Deductive logic* is the formal/mathematical theory of entailment or logical consequence; it is controversial whether there is a similarly formal/mathematical theory of inductive strength.)

Although invalidity is not necessarily a sign of failure, often arguments in philosophy are good arguments only if they are valid. There are many exceptions to this, but in 24.09x it's a good rule of thumb. So the first thing you should ask yourself in evaluating an argument from the readings is whether it is valid. Is it possible for the conclusion to be false and the premises true?

Exercise: determine, for each of the two arguments from Lewis Carroll (i.e. (1) and (2)), and for each of the following arguments, whether it is valid or invalid. If the argument is invalid, explain why.

(15) Mr Toad's troubles were caused either by a conspiracy of stoat and weasels, or by his own animal urges.
 They were caused by his animal urges.
 ____
 There was no conspiracy of stoats and weasels.

(16) Either Mr. Fox can outwit Boggis or pigs will fly.
 ____
 Mr. Fox can outwit Boggis.

(17) All unicorns enjoy eating grass.
 ____
 Some male unicorns enjoy eating grass.

(18) Unforgivable curses are morally wrong.
 Unforgivable curses are not a constitutional right.
 ____
 Unforgivable curses ought to be against the law.

(19) Either moles or badgers write poetry.
 Moles do not write poetry.
 ____
 Badgers write poetry.

Exercise. Some sentences express (absolutely) *necessary truths*: truths that could not possibly have been false, no matter how the world could have been.[3] The truths of pure mathematics are the best examples. 3 is in fact greater than 1 and, moreover, there is no possible circumstance in which 3 is *not* greater than 1, so "3>1" expresses a necessary truth. With this in mind, show that an argument whose conclusion expresses a necessary truth is automatically a valid argument.

Sometimes an argument which is invalid (and also not inductively strong) as written can easily be "fixed up" so that it is valid and in line with what the proponent of the argument intended. The most common reason for this kind of "corrigible" invalidity is missing premises. Sometimes a writer does not state all of his or her premises explicitly, and this renders his or her argument invalid. In such cases we can make the argument valid by supplying an appropriate premise, supposing that the writer intended it to be a premise all along. You should become adept at filling in missing premises so that you can see the structure of an argument more clearly.

Exercise: supply the missing premises to arguments (15), (16), (17)[4] and (18) above, and to the following arguments:

(20) If your mistreatment of house-elves is revealed, you'll lose your reputation as a witch of integrity.
———
Your nomination to head up the Ministry of Magic will collapse.

(21) Killing hobbits involves terminating the existence of some organic matter.
———
Killing hobbits is always morally wrong.

Note that sometimes a premise is left out because it is taken to be obvious, as in argument (16) above. However, sometimes the missing premise is contentious, as in (18) above. Sometimes, in fact, it is the most contentious premise of the argument, as in (21) above.

Validity is a good feature of an argument, but clearly is not the only good feature—argument (19) above is valid, but nonetheless is defective in some way. But what way?

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[3] See the Glossary entry **Necessity and possibility**.

[4] Hint: "Not all the eggs in the basket are brown" is true just in case there is at least one egg in the basket that isn't brown. Suppose that there are *no* eggs in the basket. Then "Not all the eggs in the basket are brown" is false, and so "All the eggs in the basket are brown" is true when there are no eggs in the basket. Now, there are no unicorns. What does that tell you about the premise of (17)?

Definition:

A deductive argument is *sound* just in case it is valid and all its premises are true. An argument that is not sound is *unsound*.

Now we can say what is wrong with argument (19): despite being valid, it is *unsound*.

Note the following fact, which is a consequence of the definitions of soundness and validity:

The conclusion of a sound argument is true.

This fact has practical import. It means that if disagree with the conclusion of an argument you find in one of the readings, the onus is on you to show why the argument is unsound. For if it is sound, the conclusion is true. Therefore, if the conclusion is false, the argument must be unsound. This means that either the conclusion is not entailed by the premises or at least one of the premises is false. In philosophy, it is never enough simply to say that you disagree with someone's position, or that his or her position is mistaken. If it is mistaken, there must be something wrong with the argument, and you need to say what it is.

Soundness is thus a very important criterion in evaluating both arguments from the readings and your own arguments. After having identified the conclusion for which a writer is arguing, and the premises which he or she advances in support of that conclusion, you should attempt to determine whether the argument, thus reconstructed, is sound. If it is not sound, it may yet be inductively strong, with true premises. If it is neither, it may be committed to the flames.

Argument Forms

You may have noticed that your assessment of, for example, (19) as valid had nothing in particular to do with its subject matter, the poetical inclinations of moles and badgers. Any argument of the same *form* is valid, where the form of (19) is what we might call its "logical skeleton", revealed by, first, rephrasing (19) to make its structure clearer:

Either moles write poetry or badgers write poetry.
It is not the case that moles write poetry.
___
Badgers write poetry.

And then, second, replacing the sentences "Moles write poetry" and "Badgers write poetry" with, respectively, the *schematic letters* "P" and "Q":

Either P or Q
It is not the case that P
Q

Here are some examples of valid forms of argument.

Modus ponens. The general form of a modus ponens argument is given in (22). Two examples follow.

(22) If P then Q
P
Q

(23) If Bruce Bogtrotter eats the entire cake, then the Trunchbull will be very annoyed.
Bruce Bogtrotter eats the entire cake.
The Trunchbull will be very annoyed.

(24) If house-elves enjoy being enslaved, then we should leave them alone.
House-elves enjoy being enslaved.
We should leave them alone.

Modus tollens. The general form of a modus tollens argument is given in (25). Two examples follow.

(25) If P then Q
It is not the case that Q (often written "Not-Q")
It is not the case that P

(26) If Filch can revive Mrs. Norris then he has supernatural powers.
He does not have supernatural powers.
Filch cannot revive Mrs. Norris.

(27) If green eggs and ham are delicious, then green eggs are delicious.
Green eggs are not delicious.
Green eggs and ham are not delicious.

Disjunctive syllogism. Argument (19) above is a disjunctive syllogism. The general form of such an argument is given in (28a) and (28b). Two examples follow.

(28a) (Either) P or Q
It is not the case that P
$\overline{\text{Q}}$

(28b) (Either) P or Q
It is not the case that Q
$\overline{\text{P}}$

(29) Either Hermione spends all her money on shoes or Minerva does.
Hermione does not spend all her money on shoes.
Minerva does.

(30) Either Matilda is a prodigy, or Miss Honey is deluded.
Miss Honey is not deluded.
Matilda is a prodigy.

Categorical syllogism. Two general types of categorical syllogism are given in (31a) and (31b). Two examples follow.

(31a) All Fs are G
x is (an) F
x is G

(31b) All Fs are G
All Gs are H
All Fs are H

(32) All wizards shave.
Gandalf is a wizard.
Gandalf shaves.

(33) All goblins are orcs.
All orcs dislike sunlight.
All goblins dislike sunlight.

Hypothetical syllogism. The general form of a hypothetical syllogism is given in (34). Two examples follow.

(34) If P then Q
If Q then R
If P then R

(35) If Harry's a better Seeker than Viktor, then he's a better Seeker than Cho.
If Harry's a better Seeker than Cho, then he's a better Seeker than Cedric.
If Harry's a better Seeker than Viktor, then he's a better Seeker than Cedric.

(35) If a giant peach crushed Aunt Sponge then she is dead.
If Aunt Sponge is dead then James is delighted.
____
If a giant peach crushed Aunt Sponge then James is delighted.

Common Flaws

Arguments can have various kinds of flaws: for example, invalidity, false premises, dialectical ineffectiveness. NB: these are quite different, and should not be confused—false premises and failure to persuade an opponent are not *logical* flaws.

Exercise: give an example of a dialectically ineffective argument (i.e. an argument that your imagined opponent will find unpersuasive) that is also sound.

Some of these flaws have common labels, as follows.

The *fallacy of equivocation*: using key terms in different senses in different parts of the argument. For instance, if "pen" in the first premise means *enclosure*, and "pen" in the second means *writing implement*, then the following argument is invalid because of equivocation:

(36) There is a dragon in the pen.
The pen is in Harry's pocket.
____
There is a dragon in Harry's pocket.

Begging the question (also known as a *circular argument*): assuming what you are trying to prove. We will seldom see really obvious cases of begging the question in the readings. What we may see is a weak form of begging the question, namely putting forward as a premise something so close to the conclusion that no one would believe the premise who didn't already believe the conclusion. This is an ineffective mode of argument, precisely because it does not persuade.[5]

Proving too much: sometimes an argument N *seems* good (e.g. valid, sound), but N is only good if a similar argument M is also good, and M is clearly *not* good. In that case, argument N "proves too much". For example, take this argument for the existence of God: "By definition, God is the greatest being, and it is greater to exist than not to exist, hence God exists". That would seem to prove too much, because it seems just like this

[5] See the Glossary entry **Begging the question and circular arguments**.

argument, which surely does *not* establish its conclusion: "“By definition, the most perfect island is the greatest island, and it is greater to exist than not to exist, hence the most perfect island exists”. Another example is (21) above.

Appeals to authority: in philosophy, there are no authorities, at least in the sense that it is never acceptable to support a position simply by pointing out that someone we’ve read holds it. David Chalmers is on the philosophy All-Star team, and endorses dualism, but you shouldn’t argue that dualism is true because Chalmers thinks it is.

Straw man arguments: representing your opponent’s position or argument unfairly so that it is easier to demolish. In such cases, you have at best refuted a “straw man”, not your actual opponent.