Validity: A Guide

One of the most important concepts in logic is 'validity'. This is often confused with 'truth'. However, truth and validity are different things and it is important in logical reasoning to distinguish the differences. 'Validity' is to do with the logical form of arguments rather than the truth of the propositions it contains. Arguments, for instance can have true conclusions but are invalid. However, arguments can also be valid but with false or untrue conclusions. So what does this mean?

First, one has to appreciate that an 'argument' in logic is not a slanging match between adversaries but a structured form of reasoning that contains premises leading to a conclusion. Typical of this is a 'categorical syllogism'. Premises, can be facts, pieces of information or propositions. However, the pieces of information and propositions could be true or false. For example a premise could be-

'The cat is stuck in the tree'.

This statement could be true, the cat may be genuinely stuck in the tree but alternatively one may find out later that the cat eventually managed to free itself and reach the ground on its own accord. Let us look at a categorical syllogism that contains true premises and a true conclusion-

No cats have feathers.   (Premise 1)
Tabby is a cat.   (Premise 2)
Therefore Tabby does not have feathers   (Conclusion)

From the information given in the premises one can deduce the conclusion and this is an example of a valid argument. When the premises are true and the conclusion deducted correctly then the argument is said to be *sound*. All *sound* arguments are valid and have true conclusions and true premises. Deductive arguments differ from inductive arguments which are based on evidence and their conclusions are not necessarily true. (See below)

Example of a valid categorical syllogism that is not sound-

All men have three legs and three eyes.   (Premise 1)
Queen Victoria was a man.   (Premise 2)
Therefore Queen Victoria had three legs and three eyes. (Conclusion)

Although the conclusion follows validly from the premises the argument is not sound because the premises are false and the conclusion is false too.

Example of a categorical syllogism that is not valid or sound*:*

Some footballers are paid high salaries. (Premise 1)
Barry is paid a high salary.   (Premise 2)
Therefore Barry is a footballer.   (Conclusion)

Although the conclusion may possibly be true it does not follow from the premises.
Some footballers receive high salaries but not all high salary earners have to be footballers.
Barry may not be a footballer.

Example where both premises and conclusion may be true but the argument may be invalid.

All cats are mammals.   (Premise 1)
No mammals are reptiles.   (Premise 2)
Therefore, all cats are not amphibians.   (Conclusion)

Example where both premises are false and the conclusion is true, yet the argument is valid.

All pigs are birds.   (Premise 1)
All sparrows are pigs.   (Premise 2)
Therefore, all sparrows are birds.   (Conclusion)

Another thing to be aware of is ambiguity in a premise, this can cause an argument to be invalid.
For instance-

Jenny likes to collect stamps.
Snowbell the horse could give one a good stamp with her hind legs.
Therefore Jenny could get a stamp from Snowbell for her collection.

To Jenny a 'stamp' is a symbol or picture printed on a small piece of adhesive paper that is used on posted materials. Whereas, a 'stamp' to Snowbell is hitting the ground hard with the hooves of the hind legs.

Vagueness in premises can also lead to invalidity –

Young women go to parties hoping to find a husband.
Husbands may go to parties hoping to meet young women.
Therefore parties are good meeting places to begin relationships.

This argument is invalid because the first premise is vague and therefore misleading.
The first premise should be written more clearly to reflect the true intentions of young women;
Young women go to parties hoping to find unmarried men who may be potential future husbands.

The Kin Selection Fallacy

Valid arguments can be misleading and produce conclusions that are patently false, if one or more of the premises are false. These are not always that easy to detect. Take this example from Evolutionary Biology concerning Kin Selection. The argument was put forward by J.B.S. Haldane in 1932 when he joked that he would willingly die for two brothers or eight cousins.
What he meant by this was that we inherit half of our genes (sometimes alleles in the literature) from our mother and the other half from our father. This implies that a child shares 50 per cent of its genes with either parent. It follows from this that a grandchild has only a 25 per cent share with the grandparents. This led some biologists to conclude that we are more likely to be altruistic toward close relations than to distant relations or strangers because 'one wishes to see one's genes maximised in a population'. Hence, saving the life of two brothers is equivalent to saving the life of eight cousins, as the supposed gene count is the same. Let's see how this is set out in a syllogism-

An individual acts to maximise their genes wherever possible.
To maximise one's genes one gives preferential help to those most closely related.
Altruism (preferential help) is therefore more likely to happen between individuals that share the greater number of genes.

Some biologists believe they have provided a biological explanation for altruistic behaviour, based on the syllogism (or similar syllogism above). However, there is a serious flaw with at least one of the premises. Can you spot it?

Consider the premise that one shares half of the genes with either parent. This implies that one shares only 25 per cent of one's genes with one's grandparents and therefore only a 12.5 per cent share with either great grandparent, and therefore only a 6.25 per cent share with great-great grandparents, and so forth. This would lead to the rather absurd conclusion that our ancestors from the 18th century would share very nearly no genes at all with us. So where are the biologists going wrong? They certainly do not want to say that present day humans are genetically unrelated to their ancestors.

The answer is simple to see, although we do take half of our genetic material from either parent, what is forgotten is that most of this material is very similar in either parent. If you cannot see the problem think of this analogy. Take two bags of liquorice allsorts which are almost identical in contents but not quite. Open each bag and take half the contents randomly from each bag and collect these sweets into

a new bag. One will find that the contents of the new bag are actually fairly similar to those of either of the original bags. There will not be a 50 per cent difference.

If you wish to see an expanded exposition of the Kin Selection Fallacy see –

Who Holds the Moral High Ground? By Beckley & Waters

Deduction and Induction

The logic tests provided on this site are looking for arguments that are deductively valid.
There is another form of reasoning where the arguments are 'inductive' rather than deductive. These inductive arguments take a different form the syllogisms given above. One finds these types of arguments in science or in the law courts. There is never a case where an inductive conclusion is necessarily true. Inductive conclusions could be inconclusive and even false, but normally one takes them as true if they are supported by very good evidence.

For instance-

Smith was caught running from the scene of the robbery.
Smith was found to have on his possession jewellery from the shop that was burgled.
Witnesses saw Smith throw a brick into the jewellery shop window.
The fingerprints on the brick matched those of Smith.
The Judge concluded that Smith was guilty of robbery.

Did the Judge draw the correct conclusion?
If the Judge drew an *inductive* conclusion them the judge is on good grounds as there is a lot of evidence to support his decision. This is normally sufficient in these matters. However, one cannot *deduce* that Smith was guilty, for there is always the possibility of unknown evidence. For instance, Smith could have been set-up, or the witnesses were mistaken and the brick stolen earlier from Smith's house by a person unknown to the court. Indeed, many a person has been convicted on what seemed overwhelming evidence at the time only to find evidence surface at a later date that brings the original conviction into doubt.

When Sherlock Holmes said he had deduced his conclusion what he was mostly doing was arriving at a conclusion by inductive reasoning.

Watch out for this in the tests.

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