GSP 2205 - Logic and Philosophy

Module 6 - Arguments and Fallacies
Lecture Notes

Hassan Mohammad

Department of Mathematical Sciences

Bayero University Kano

1 Argument

Definition 1.1. An argument is a group of statements, one or more of which are claimed to provide support for, or reasons to believe, one of the others.

Definition 1.2. An argument is a sequences of propositions (statements). A proposition is a sentence that is either *true or false.*

Definition 1.3. An argument is a set of statement some of which serve as premises/ or hypothesis, one of which serve as conclusion, where the premises are intended to provide evidence for the conclusion.

An argument consist of one or more premises and a conclusion. There are some words or phrases that indicate or give clues in identifying argument conclusion, such as: therefore, thus, so, consequently, accordingly, whence, it follows that, implies that, as a result, etc.

Example 1
It is wrong to kill human being.
Abortion takes the life (kills) a human being.
Therefore, abortion is wrong.
Example 2
If I work all night on this homework, then I can answer all the exercises.
If I answer all the exercises, then I will understand the material.
Therefore, If I work all night on this homework, then I will understand the material.
Example 3
All crimes are violations of the law.
Theft is a crime.
Therefore, theft is a violation of the law.

1.1 Deductive and Inductive Arguments

Arguments can be divided into two categories: Deductive and Inductive.

1.1.1 Deductive Argument

A **deductive argument** is an argument in which the premises are claimed to support the conclusion in such a way that it is *impossible* for the premises to be true and the conclusion false. In such arguments the conclusion is claimed to follow necessarily from the premises.

1.1.2 Inductive Argument

An **inductive argument** is an argument in which the premises are claimed to support the conclusion in such a way that it is*improbable* that the premises be true and the conclusion false. In these arguments the conclusion is claimed to follow only probably from the premises.

Thus, deductive arguments are those that involve necessary reasoning, and inductive arguments are those that involve probabilistic reasoning. Examples:

Deductive Arguments

Example 1
All television networks are media companies.
NTA is a television network.
Therefore, NTA is a media company.

Example 2
All squares are rectangle.
All rectangles have four sides.
Therefore, all squares have four sides.

Example 3
The meerkat is a member of mangoose family .
All members of the mongoose family are carnivores.
Therefore, the meerkat is a carnivore.

Inductive Arguments

Example 1
You are a good student.
You get all A's.
Therefore, your friends must get all A's too.

Example 2
Amina hails from Adamawa.
Adamawa's are tall.
Therefore, Amina is tall.

Example 3
The vast majority of saleswoman are extroverts.
Talatu is a saleswoman.
Therefore, Talatu is an extroverts.

1.2 Validity, Soundness, Strongness and Cogency

We have seen that every argument makes two basic claims: a claim that evidence or reasons exist and a claim that the alleged evidence or reasons support something (or that something follows from the alleged evidence or reasons). The first is a **factual claim**, the second an **inferential claim**. The evaluation of every argument centers on the evaluation of these two claims. The most important of the two is the inferential claim, because if the premises fail to support the conclusion (that is, if the reasoning is bad), an argument is worthless. Thus we will always test the inferential claim first, and only if the premises do support the conclusion will we test the factual claim (that is, the claim that the premises present genuine evidence, or are true).

1.2.1 Valid Deductive Argument

A valid deductive argument is an argument such that it is impossible for the premises to be true and the conclusion false. In these arguments the conclusion follows with strict necessity from the premises.

1.2.2 Invalid Deductive Argument

An invalid deductive argument is a deductive argument such that it is possible for the premises to be true and the conclusion false. In invalid arguments the conclusion does not follow with strict necessity from the premises, even though it is claimed to.

An immediate consequence of these definitions is that there is no middle ground between valid and invalid. There are no arguments that are "almost" valid and "almost" invalid.

Note: If the conclusion follows with strict necessity from the premises, the argument is valid; if not, it is invalid.

1.2.3 Testing Validity of an Argument

To test an argument for validity we begin by assuming that all premises are true, and then we determine if it is possible, in light of that assumption, for the conclusion to be false. Here are some examples:

Example 1

All television networks are media companies.
NTA is a television network.
Therefore, NTA is a media company.

In this argument both premises are actually true, so it is easy to assume that they are true. Next we determine, in light of this assumption, if it is possible for the conclusion to be false. Clearly this is not possible. If NTA is included in the group of television networks (second premise) and if the group of television networks is included in the group of media companies (first premise), it necessarily follows that NTA is included in the group of media companies (conclusion). In other words, assuming the premises true and the conclusion false entails a strict contradiction. Thus the argument is valid.

Example 2

All automakers are computer manufacturers.
United Airlines is an automaker.
Therefore, United Airlines is a computer manufacturer.

In this argument, both premises are actually false, but it is easy to assume that they are true. Every automaker could have a corporate division that manufactures computers. Also, in addition to flying airplanes, United Airlines could make cars. Next, in light of these assumptions, we determine if it is possible for the conclusion to be false. Again, we see that this is not possible, by the same reasoning as the previous example. Assuming the premises true and the conclusion false entails a contradiction. Thus, the argument is valid.

Example 3

All banks are financial institutions.
NNPC is a financial institution.
Therefore, NNPC is a bank.

As in the first example, both premises of this argument are true, so it is easy to assume they are true. Next we determine, in light of this assumption, if it is possible for the conclusion to be false. In this case it is possible. If banks were included in one part of the group of financial institutions and NNPC were included in another part, then NNPC would not be a bank. In other words, assuming the premises true and the conclusion false does not involve any contradiction, and so the argument is invalid.

Remark 1: Validity is something that is determined by the relationship between premises and conclusion. The question is not whether premises and conclusion are true or false, but whether the premises support the conclusion. In the examples of valid arguments the premises do support the conclusion, and in the invalid case they do not.

1.2.4 Sound Argument

A sound argument is a deductive argument that is valid and has all true premises.

Both conditions must be met for an argument to be sound, and if either is missing the argument is unsound. Thus, an unsound argument is a deductive argument that is invalid, has one or more false premises, or both. Because a valid argument is one such that it is impossible for the premises to be true and the conclusion false, and because a sound argument does in fact have true premises, it follows that every sound argument,

by definition, will have a true conclusion as well. A sound argument, therefore, is what is meant by a "good" deductive argument in the fullest sense of the term.

Table 1.1 Deductive Argument

	Valid	**Invalid**
True premises True Conclusion	All level two students are undergraduate. I am a level two student. Therefore, I am undergraduate. **(Sound)**	All level two students are undergraduate. I am an undergraduate. Therefore, I am a level two student. **(Unsound)**
True premises False Conclusion	None exist	Nigeria is in Africa. There exists some Indians in Nigeria. Therefore, India is in Nigeria. **(Unsound)**
False premises True Conclusion	All chairs are computers. iPad is a chair. Therefore, iPad is a computer. **(Unsound)**	All computers are chairs. iPad is a chair. Therefore, iPad is a computer. **(Unsound)**
False premises False Conclusion	All GSP courses are core for all students. Maths is a GSP course. Therefore, Maths is core for all students. **(Unsound)**	All GSP courses are core for all students. Maths is a core course for all students. Therefore, Maths is a GSP course. **(Unsound)**

Table 1.1 presents examples of deductive arguments that illustrate the various combinations of truth and falsity in the premises and conclusion. In the examples having false premises, both premises are false, but it is easy to construct other examples having only one false premise. When examining this table, note that the only combination of truth and falsity that does not allow for both valid and invalid arguments is true premises and false conclusion. As we have just seen, any argument having this combination is necessarily invalid.

1.2.5 Strong Inductive Argument

A strong inductive argument is an inductive argument such that it is improbable that the premises be true and the conclusion false. In such arguments, the conclusion follows probably from the premises.

1.2.6 Weak Inductive Argument

A weak inductive argument is an inductive argument such that the conclusion does not follow probably from the premises, even though it is claimed to.

The procedure for testing the strength of inductive arguments runs parallel to the procedure for deduction. First we assume the premises are true, and then we determine whether, based on that assumption, the conclusion is probably true.

Example 1

All dinosaur bones discovered to this day have been at least 50 million years old.
Therefore, probably the next dinosaur bone to be found will be at least 50 million years old.

In this argument the premise is actually true, so it is easy to assume that it is true. Based on that assumption, the conclusion is probably true, so the argument is strong.

Example 2

This barrel contains 100 oranges.
80 oranges selected at random were found to be ripe.
Therefore, probably all 100 oranges are ripe.

This is indeed an example of a strong argument because, about 80% of the oranges selected at random are ripe, probably the remaining 20 oranges are also ripe.

Example 3

When a lighted match is slowly dunked into water, the flame is snuffed out.
But gasoline is a liquid, just like water.
Therefore, when a lighted match is slowly dunked into gasoline, the flame will be snuffed out.

In this argument the premises are actually true and the conclusion is probably false. Thus, if we assume the premises are true, then, based on that assumption, it is not probable that the conclusion is true. Thus, the argument is weak.

1.2.7 Cogent Argument

A cogent argument is an inductive argument that is strong and has all true premises; if either condition is missing, the argument is *uncogent*.

Thus, an uncogent argument is an inductive argument that is weak, has one or more false premises, or both. A cogent argument is the inductive analogue of a sound deductive argument and is what is meant by a "good" inductive argument without qualification. Because the conclusion of a cogent argument is genuinely supported by true premises, it follows that the conclusion of every cogent argument is probably true.

There is a difference, however, between sound and cogent arguments in regard to the true-premise requirement. In a sound argument it is only necessary that the premises be true and nothing more. Given such premises and good reasoning, a true conclusion is guaranteed. In a cogent argument, on the other hand, the premises must not only be true, they must also not ignore some important piece of evidence that outweighs the given evidence and entails a quite different conclusion.

Table 1.2 Inductive Argument

	Strong	**Weak**
True premises True Conclusion	All previous Nigerian presidents were men. Therefore, probably the next Nigerian president will be a man. **(Cogent)**	All previous Nigerian presidents were Federalists. Therefore, probably the next Nigerian president will be a man. **(Uncogent)**
True premises False Conclusion	None exist	A few Nigerian presidents were Federalists. Therefore, probably the next Nigerian president will be a man. **(Uncogent)**
False premises True Conclusion	All previous Nigerian presidents were television debaters. Therefore, probably the next Nigerian president will be a television debater. **(Uncogent)**	A few Nigerian presidents were Libertarians. Therefore, probably the next Nigerian president will be a television debater. **(Uncogent)**
False premises False Conclusion	All previous Nigerian presidents were women. Therefore, probably the next Nigerian president will be a woman. **(Uncogent)**	A few Nigerian presidents were Libertarians. Therefore, probably the next Nigerian president will be a Libertarian. **(Uncogent)**

Table 1.2 presents the various possibilities of truth and falsity in the premises and conclusion of inductive arguments. Note that the only arrangement of truth and falsity that is missing for strong arguments is true premises and probably false conclusion.

Unlike the validity and invalidity of deductive arguments, the strength and weakness of inductive arguments admit of degrees. To be considered strong, an inductive argument must have a conclusion that is more probable than improbable. In other words, the likelihood that the conclusion is true must be more than 50 percent, and as the probability increases, the argument becomes stronger.

2 Fallacy

Definition 2.1. A fallacy is a defect in an argument that consists in something other than merely false premises.

Definition 2.2. A fallacy is a type of argument that may seem to be correct but which upon very close examination turns out not to be so.

As we will see, fallacies can be committed in many ways, but usually they involve either a mistake in reasoning or the creation of some illusion that makes a bad argument appear good (or both). Both deductive and inductive arguments may contain fallacies; if they do, they are either unsound or uncogent, depending on the kind of argument. Conversely, if an argument is unsound or uncogent, it has one or more false premises or it contains a fallacy (or both).

There are two groups of fallacy. They are **Formal** and **Informal fallacies**. Formal fallacies have to do with the violation of certain rules of valid inference, whereas informal fallacies are errors in reasoning that we may fall into either because of carelessness or inattention, or because we want to trick others into accepting our position based on convictions that are not relevant to the issue at hand. Informal fallacy, which is our main concern here, can be further classified into three categories. They are the **fallacies of relevance, fallacies of ambiguity** and **fallacies of presumption**.

2.1 Informal Fallacy

Informal fallacies are those that can be detected only through analysis of the content of the argument, such fallacies can affect both deductive and inductive arguments. Consider the following example:

Example 1
All factories are plants.
All plants are things that contain chlorophyll.
Therefore, all factories are things that contain chlorophyll.

The above argument is clearly invalid because it has true premises and a false conclusion. An analysis of the content that is, the meaning of the words reveals the source of the trouble. The word "plants" is used in two different senses. In the first premise it means a building where something is manufactured, and in the second it means a life form.

2.2 Fallacies of Relevance

The fallacies of relevance share the common characteristic that the arguments in which they occur have premises that are logically irrelevant to the conclusion. Yet the premises are relevant psychologically, so the conclusion may seem to follow from the premises, even though it does not follow logically. The fallacies of relevance occur when the premises of an argument are not relevant to the conclusion. In a good argument the premises provide genuine evidence in support of the conclusion. In an argument that commits a fallacy of relevance, on the other hand, the connection between premises and conclusion is emotional. To identify a fallacy of relevance, therefore, one must be able to distinguish genuine evidence from various forms of emotional appeal.

2.2.1 Appeal to Force (Argumentum ad Baculum)

The fallacy of appeal to force occurs whenever an arguer poses a conclusion to another person and tells that person either implicitly or explicitly that some harm will come to him or her if he or she does not accept the conclusion. The fallacy always involves a threat by the arguer to the physical or psychological well-being of the listener or reader, who may be either a single person or a group of persons. Obviously, such a threat is logically irrelevant to the subject matter of the conclusion, so any argument based on such a procedure is fallacious. For example:

"Who wants be a milloniere" is the best show on TV; and if you don't believe it, I'm going to call my big brother over here and he's going to beat you up.

2.2.2 Appeal to Pity (Argumentum ad Misericordiam)

The appeal to pity fallacy occurs when an arguer attempts to support a conclusion by merely evoking pity from the reader or listener. This pity may be directed toward the arguer or toward some third party. Example:

Your Honor, I admit that I declared thirteen children as dependents on my tax return, even though I have only two. But if you find me guilty of tax evasion, my reputation will be ruined. I'll probably lose my job, my poor wife will not be able to have the operation that she desperately needs, and my kids will starve. Surely I am not guilty.

The conclusion of this argument is "Surely I am not guilty." Obviously, the conclusion is not logically relevant to the arguer's set of pathetic circumstances, although it is psychologically relevant. If the arguer succeeds in evoking pity from the listener or reader, the latter is likely to exercise his or her desire to help the arguer by accepting the argument. In this way the reader or listener may be fooled into accepting a conclusion that is not supported by any evidence. The appeal to pity is quite common and is often used by students on their instructors at exam time and by lawyers on behalf of their clients before judges and juries.

2.2.3 Appeal to Authority (Argumentum ad verecundiam)

This fallacy involves the mistaken argument that there is some connection between the truth of a proposition and some feature of the person who asserts or denies it. When the opinion of someone famous or accomplished in another area of expertise is appealed to in order to guarantee the truth of a claim outside the province of that authority's field, this fallacy is committed. Consider this example:
John Adeoye, a Professor of Philosophy at the University of Lagos, believes that the sum of the four angles of a rectangle is 135 degrees. Therefore the sum of the four angles of a rectangle is 135 degrees.

2.2.4 Argument Against the Person (Argumentum ad Hominem)

This fallacy always involves two arguers. One of them advances (either directly or implicitly) a certain argument, and the other then responds by directing his or her attention not to the first person's argument but to the first person himself. When this occurs, the second person is said to commit an argument against the person.

The argument against the person occurs in three forms: the ad hominem abusive, the ad hominem circumstantial, and the tu quoque. In the ad hominem abusive, the second person responds to the first person's argument by verbally abusing the first person. The ad hominem circumstantial begins the same way as the ad hominem abusive, but instead of heaping verbal abuse on his or her opponent, the respondent attempts to discredit the opponent's argument by alluding to certain circumstances that affect the opponent. By doing so the respondent hopes to show that the opponent is predisposed to argue the way he or she does and should therefore not be taken seriously. The tu quoque ("you too") fallacy begins the same way as the other two varieties of the ad hominem argument, except that the second arguer attempts to make the first appear to be hypocritical or arguing in bad faith. The second arguer usually accomplishes this by citing features in the life or behavior of the first arguer that conflict with the latter's conclusion. In effect, the second arguer says, "How dare you argue that I should stop doing X; why, you do (or have done) X yourself." Example:

Child to Parent: *Your argument that I should stop stealing candy from the corner store is no good. You told me yourself just a week ago that you, too, stole candy when you were a kid.*

2.2.5 Appeal to Ignorance (argumentum ad ignorantiam)

This fallacy is committed when one posits that a proposition is true simply on the basis that it has not been proved false or that it is false because it has not been proved true. The following passage commits this fallacy:

No one has conclusively proven that there is no intelligent life on the moons of Jupiter. Therefore, there is intelligent life on the moons of Jupiter.

2.2.6 Missing the Point (Ignoratio Elenchi)

All the fallacies we have discussed thus far have been instances of cases where the premises of an argument are irrelevant to the conclusion. Missing the point illustrates a special form of irrelevance. This fallacy occurs when the premises of an argument support one particular conclusion, but then a different conclusion, often vaguely related to the correct conclusion, is drawn. Whenever one suspects that such a fallacy is being committed, he or she should be able to identify the correct conclusion, the conclusion that the premises logically imply. This conclusion must be significantly different from the conclusion that is actually drawn. For example:

Crimes of theft and robbery have been increasing at an alarming rate lately. The conclusion is obvious: we must reinstate the death penalty immediately.

At least two correct conclusions are implied by the premise of the first argument: either "We should provide increased police protection in vulnerable neighborhoods" or "We should initiate programs to eliminate the causes of the crimes." Reinstating the death penalty is not a logical conclusion at all. Among other things, theft and robbery are not capital crimes.

Ignoratio elenchi means "ignorance of the proof." The arguer is ignorant of the logical implications of his or her own premises and, as a result, draws a conclusion that misses the point entirely.

2.3 Fallacies of Ambiguity

In addition to fallacies of relevance, there are several patterns of incorrect reasoning that arise from the imprecise use of language. An ambiguous word, phrase or sentence is one that has two or more distinct meanings. The following are examples of fallacies of ambiguity:

2.3.1 Fallacy of Equivocation

The fallacy of equivocation occurs when the conclusion of an argument depends on the fact that a word or phrase is used, either explicitly or implicitly, in two different senses in the argument. Such arguments are either invalid or have a false premise, and in either case they are unsound. Examples:

Some triangles are obtuse. Whatever is obtuse is ignorant. Therefore, some triangles are ignorant.
We have a duty to do what is right. We have a right to speak out in defense of the innocent. Therefore, we have a duty to speak out in defense of the innocent.

In the first argument "obtuse" is used in two different senses. In the first premise it describes a certain kind of angle, while in the second it means dull or stupid. The second argument uses "right" in two senses. In the first premise "right" means morally correct, but in the second it means a just claim or power. The fourth argument illustrates the ambiguous use of a relative term.

2.3.2 Fallacy of Composition

The fallacy of composition is committed when the conclusion of an argument depends on the erroneous transference of an attribute from the parts of something onto the whole. In other words, the fallacy occurs when it is argued that because the parts have a certain attribute, it follows that the whole has that attribute too and the

situation is such that the attribute in question cannot be legitimately transferred from parts to whole. Examples:

Each player on this basketball team is an excellent athlete. Therefore, the team as a whole is excellent.

Sodium and chlorine, the atomic components of salt, are both deadly poisons. Therefore, salt is a deadly poison.

In these arguments the attributes that are transferred from the parts onto the whole are designated by the words "excellent," and "deadly poison," respectively. In each case the transference is illegitimate, and so the argument is fallacious.

2.3.3 Fallacy of Division

The fallacy of division is the exact reverse of composition. As composition goes from parts to whole, division goes from whole to parts. The fallacy is committed when the conclusion of an argument depends on the erroneous transference of an attribute from a whole (or a class) onto its parts (or members). Examples:

Salt is a nonpoisonous compound. Therefore, its component elements, sodium and chlorine, are nonpoisonous. The Royal Society is over 300 years old. Professor Thompson is a member of the Royal Society. Therefore, Professor Thompson is over 300 years old.

In our account of composition and division, we have presented examples of arguments that commit these fallacies in conjunction with other, structurally similar arguments that do not. Because of the structural similarity between arguments that do and do not commit these fallacies, composition and division are classified as fallacies of grammatical analogy.

2.4 Fallacies of Presumption

Apart from the fallacies of relevance and those of ambiguity, there are some other incorrect patterns of reasoning which, for want of a better term, have been described as "Fallacies of Presumption". In these instances, the erroneous reasoning results from an implicit supposition of some further proposition whose truth is uncertain or implausible. The followings are examples of fallacies of presumption:

2.4.1 Fallacy of Accident

The fallacy of accident is committed when a general rule is applied to a specific case it was not intended to cover. Typically, the general rule is cited (either directly or implicitly) in the premises and then wrongly applied to the specific case mentioned in the conclusion. For example:

Freedom of speech is a constitutionally guaranteed right. Therefore, John Q. Radical should not be arrested for his speech that incited the riot last week.

The general rule is that freedom of speech is normally guaranteed, and the specific case is the speech made by John Q. Radical. Because the speech incited a riot, the rule does not apply. The fallacy of accident gets its name from the fact that the specific case exhibits some attribute, or "accident," that prevents the general rule from applying.

2.4.2 Fallacy of False Cause

The fallacy of false cause occurs whenever the link between premises and conclusion depends on some imagined causal connection that probably does not exist. Whenever an argument is suspected of committing the false cause fallacy, the reader or listener should be able to say that the conclusion depends on the supposition that X causes Y, whereas X probably does not cause Y at all. Examples:

Successful business executives are paid salaries in excess of N500,000. Therefore, the best way to ensure that Ali will become a successful executive is to raise his salary to at least N500,000.

There are more laws on the books today than ever before, and more crimes are being committed than ever before. Therefore, to reduce crime we must eliminate the laws.

The first and second arguments illustrate a variety of the false cause fallacy called non causa pro causa ("not the cause for the cause"). This variety is committed when what is taken to be the cause of something is not really the cause at all and the mistake is based on something other than mere temporal succession. In reference to the first argument, success as an executive causes increases in salary - not the other way around - so the argument mistakes the cause for the effect. In reference to the second argument, the increase in crime is, for the most part, only coincidental with the increase in the number of laws. Obviously, the mere fact that one event is coincidental with another is not sufficient reason to think that one caused the other.

There is another variety of the false cause fallacy called post hoc ergo propter hoc ("after this, therefore on account of this"). This variety of the fallacy presupposes that just because one event precedes another event the first event causes the second. Obviously, mere temporal succession is not sufficient to establish a causal connection. Nevertheless, this kind of reasoning is quite common and lies behind most forms of superstition. For example:

A black cat crossed my path and later I tripped and sprained my ankle. It must be that black cats really are bad luck.

2.4.3 Begging the Question (Petitio Principii)

The fallacy of begging the question is committed whenever the arguer creates the illusion that inadequate premises provide adequate support for the conclusion by leaving out a key premise, by restating the conclusion as a premise, or by reasoning in a circle. The latin name for this fallacy, petitio principii, means "request for the source." The actual source of support for the conclusion is not apparent, and so the argument is said to beg the question. After reading or hearing the argument, the observer is inclined to ask, "But how do you know X?" where X is the needed support.

The first, and most common, way of committing this fallacy is by leaving a key premise out of the argument while creating the illusion that nothing more is needed to establish the conclusion. Examples:

Murder is morally wrong. This being the case, it follows that abortion is morally wrong.

Of course humans and apes evolved from common ancestors. Just look how similar they are.

The first of these arguments begs the question "How do you know that abortion is a form of murder?" The second begs the question "Does the mere fact that humans and apes look similar imply that they evolved from common ancestors?"

These questions indicate that something has been left out of the original arguments. Thus, the first argument is missing the premise, "Abortion is a form of murder"; the second is missing the premise, "The fact that humans and apes look similar implies that they have common ancestors"; and so on. These premises are crucial for the soundness of the arguments. If the arguer is unable to establish the truth of these premises, then the arguments prove nothing. However, in most cases of begging the question, this is precisely the reason why such premises are left unstated. The arguer is not able to establish their truth, and by employing rhetorical phraseology such as "of course," "clearly," "this being the case," and "after all," the arguer hopes to create the illusion that the stated premise, by itself, provides adequate support for the conclusion when in fact it does not.

2.4.4 Complex Question

The fallacy of complex question is committed when a single question that is really two (or more) questions is asked and a single answer is then applied to both questions. Every complex question presumes the existence of a certain condition. When the respondent's answer is added to the complex question, an argument emerges that establishes the presumed condition. Thus, although not an argument as such, a complex question involves an implicit argument. This argument is usually intended to trap the respondent into acknowledging something that he or she might otherwise not want to acknowledge. For example:

Have you stopped cheating on exams?
Where did you hide the cookies you stole?

Let us suppose the respondent answers "yes" to the first question and "under the bed" to the second. The following arguments emerge:

You were asked whether you have stopped cheating on exams. You answered "yes." Therefore, it follows that you have cheated in the past.

You were asked where you hid the cookies you stole. You replied "under the bed." It follows that you did in fact steal the cookies.

On the other hand, let us suppose that the respondent answers "no" to the first question and "nowhere" to the second. We then have the following arguments:

You were asked whether you have stopped cheating on exams. You answered "no." Therefore, you continue to cheat.

You were asked where you hid the cookies you stole. You answered "nowhere." It follows that you must have stolen them and eaten them.

Obviously, each of the questions is really two questions:

Did you cheat on exams in the past? If you did cheat in the past, have you stopped now?

Did you steal the cookies? If you did steal them, where did you hide them?

If respondents are not sophisticated enough to identify a complex question when one is put to them, they may answer quite innocently and be trapped by a conclusion that is supported by no evidence at all; or, they may be tricked into providing the evidence themselves. The correct response lies in resolving the complex question into its component questions and answering each separately.

Exercises

1. The following arguments are deductive. Determine whether each is valid or invalid, and note the relationship between your answer and the truth or falsity of the premises and conclusion. Finally, determine whether the argument is sound or unsound.

   Since Moby Dick was written by Shakespeare, and Moby Dick is a science fiction novel, it follows that Shakespeare wrote a science fiction novel.

   Since London is north of Paris and south of Edinburgh, it follows that Paris is south of Edinburgh.

   All leopards with lungs are carnivores. Therefore, all leopards are carnivores.

   All physicians are individuals who have earned degrees in political science, and some lawyers are physicians. Therefore, some lawyers are persons who have earned degrees in political science.

   The United States Congress has more members than there are days in the year. Therefore, at least two members of Congress have the same birthday.

2. The following arguments are inductive. Determine whether each is strong or weak, and note the relationship between your answer and the truth or falsity of the premise(s) and conclusion. Then determine whether each argument is cogent or uncogent.

Most famous movie stars are millionaires. Leonardo Di Caprio is a famous movie star. Therefore, probably Di Caprio is a millionaire.

People have been listening to rock and roll music for over a hundred years. Probably people will still be listening to it a year from now.

Coca-Cola is an extremely popular soft drink. Therefore, probably someone, somewhere, is drinking a Coke right this minute.

When Neil Armstrong landed on the moon, he left behind a gold plated Schwinn bicycle, which he used to ride around on the moon's surface. Probably that bicycle is still up there on the moon.

Unlike monkeys, today's humans have feet that are not suited for grasping objects. Therefore, a thousand years from now, probably humans will still have feet that are not suited for grasping objects.

3. Determine whether the following arguments are inductive or deductive. If an argument is inductive, determine whether it is strong or weak. If it is deductive, determine whether it is valid or invalid.

   Since Christmas is always on a Thursday, it follows that the day after Christmas is always a Friday.

   This figure is a Euclidean triangle. Therefore, the sum of its angles is equal to two right angles.

   Since $x + y = 10$, *and* $x = 7$, *it follows that* $y = 4$.

   If inflation heats up, then interest rates will rise. If interest rates rise, then bond prices will decline. Therefore, if inflation heats up, then bond prices will decline.

4. Identify the fallacies of presumption, ambiguity, and grammatical analogy committed by the following arguments, giving a brief explanation for your answer. If no fallacy is committed, write "no fallacy."

   Every sentence in this paragraph is well written. Therefore, the paragraph is well written.

   An athlete is a human being. Therefore, a good athlete is a good human being.

   Water will quench one's thirst. Water is composed of hydrogen and oxygen. Therefore, hydrogen and oxygen will quench one's thirst.

   All men are mortal. Therefore, some day man will disappear from the earth.

   Either you marry me right now or I'll be forced to leave you and never speak to you again. I'm sure you wouldn't want me to do that. Therefore, you'll marry me right now.

   The author warns about numerous computational errors in his accounting text. Therefore, he must have written it very carelessly.

5. Identify the fallacies of relevance, weak induction, presumption, ambiguity, and grammatical analogy committed by the following arguments, giving a brief explanation for your answer. If no fallacy is committed, write "no fallacy."

   A crust of bread is better than nothing. Nothing is better than true love. Therefore, a crust of bread is better than true love.

   Every member of the Delta Club is over 70 *years old. Therefore, the Delta Club must be over* 70 *years old.*

   Professor Andrews, surely I deserve a B in logic. I know that I have gotten F's on all the tests, but if you give me an F for my final grade, I will lose my scholarship. That will force me to drop out of school, and my poor, aged parents, who yearn to see me graduate, will be grief-stricken for the rest of their lives.

   What goes up must come down. The price of gold has been going up for months. Therefore, it will surely come down soon.

   Criminals are basically stupid, because anyone who isn't basically stupid wouldn't be a criminal.

   The students attending Rumfa College come from every one of the forty four local governments. Shehu attends Rumfa College. Therefore, Shehu comes from every one of the forty four local governments.

   A line is composed of points. Points have no length. Therefore, a line has no length.

No one has ever proved that taking vitamins actually improves a person's health. Therefore, we can conclude that vitamins are simply a waste of money.

Either the government imposes price controls on the cost of prescription drugs, or the pharmaceutical companies will continue to reap huge profits. Therefore, price controls must be imposed, because we cannot tolerate these huge profits any longer.

The vast majority of car accidents occur within twenty miles of one's home. Apparently it is much more dangerous to drive close to home than far away from home.