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PHILOSOPHY & LOGIC

THE PROCESS OF CORRECT REASONING

Logic is the art and science of correct reasoning. It includes the analysis, clarification, and evaluation of *words*, *statements*, and *arguments*.

The Greek term *logos* (λογος), which is the root of “logic,” means “word.” The ancient Greeks thought of logic as the study of the meanings of *words*, of the ways in which words can be put together to form meaningful and true *statements*, and of the ways in which statements can be put together consistently to form sound *arguments*.

For most (perhaps all) practical purposes, a *statement* (which may also be called a “proposition”) may be defined as a verbal expression that is either *true* or *false* and that may therefore be either *affirmed* or *denied*. Not all verbal expressions are statements; there are also questions, exclamations, commands, grunts, etc.¹

An *argument* is a group (or set) of statements in which one of the statements, the *conclusion*, is claimed to follow logically (by way of *inference*) from the others, which are known as *premises* (and which are claimed to be true). For example, from the premises, “All humans are mortal” and “Socrates is human,” we can infer the conclusion that “Socrates is mortal.” This argument may be written out in a formal manner as follows:

1. All humans are mortal.
2. Socrates is human.
3. Socrates is mortal.

The primary purpose of logical analysis is to determine the differences between correct and incorrect reasoning (“good” and “bad” inferences). A secondary purpose is to define the differences between “sound” and “unsound” arguments.

¹Strictly speaking, a “statement” or “proposition” is an assertion or truth claim that may (or may not) be expressed verbally (i.e., in words). A proposition is not identical with its verbal expression, since it can be expressed in various ways: e.g., “It is raining,” “Es regnet,” “Il pleut,” “Esta lloviendo,” etc.

Also, some philosophers and logicians contend that sentences such as “The present King of France is bald” express statements that are *neither true nor false* (because there is no present King of France) and that sentences such as “This sentence is false” express statements that are *both true and false* (because “This sentence is false” is false if it is true and true if it is false). If either of these contentions are correct, then it is incorrect to say that all statements are *either* true or false.

Preliminary Problem: Finding an Argument

Before we can analyze and evaluate an argument, we must find one. Not all writings and speeches are argumentative. We must distinguish between writings and speeches that contain (or are) arguments (i.e., writings and speeches that seek to prove something) and writings and speeches that do (or are) not. Often, this is not easy. As stated above, an argument is a group (or set) of statements in which one statement, the conclusion, is claimed to follow (by way of inference) from the others, which are known as premises. Single statements, questions, requests, suggestions, commands, exclamations, reports, descriptions, expositions, illustrations, explanations, etc., are not arguments. Also, with regard to a writing or speech that contains an argument, the argument must be drawn out of its larger verbal context (the entire writing or speech).

Let's consider some examples. Our aim here is not to criticize or evaluate the statements or arguments presented in the following examples. Our only purpose at this point is to illustrate the difference between statements and arguments.

Example 1: In his essay, *On Liberty*, John Stuart Mill writes, "If all mankind minus one, were of one opinion, and only one person were of the contrary opinion, mankind would be no more justified in silencing that one person, than he, if he had the power, would be justified in silencing mankind." This is not an argument, but rather a single, although complicated, statement. There are no premises and no conclusion. Mill is simply asserting that society is no more entitled to stifle the individual than the individual is entitled to stifle society.

Example 2: According to George Bernard Shaw, "All censorships exist to prevent anyone from challenging current conceptions and existing institutions. All progress is initiated by challenging current conceptions, and executed by supplanting existing institutions. Consequently the first condition of progress is the removal of censorship. There is the whole case against censorship in a nutshell." (Preface to *Mrs. Warren's Profession*). This passage contains the following argument:

1. All censorships exist to prevent anyone from challenging current conceptions and existing institutions.
2. All progress is initiated by challenging current conceptions, and executed by supplanting existing institutions.
3. The first condition of progress is the removal of censorship.

Example 3: "We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the Pursuit of Happiness." This famous passage from the *Declaration of Independence* by Thomas Jefferson, is not an argument, but a series of at least two, and perhaps three, assertions:

- A. All men [humans?] are created equal.
- B. All men [humans?] possess God-given and unalienable rights to life, liberty, and the pursuit of happiness.
- C. “A” and “B” are self-evident truths.

Each of these statements may be true, but, together, they do not constitute an argument. There are no premises to back any of them up, and, indeed, Jefferson’s claim (“C”) that “A” and “B” are self-evidently true would, if correct, make arguments in their support superfluous. Statements that are self-evidently true (for example, “A finite whole is larger than any one of its own parts”) do not need arguments to back them up. (Just for the record, isn’t “C” definitely false, “A” probably false, and “B” very debatable?)

Example 4: According to James Madison (in *The Federalist Papers*, No. 14), “The true distinction between [direct democracy and the republican form of government] . . . is, that in a [direct] democracy, the people meet and exercise the government in person; in a republic, they assemble and administer it by their representatives and agents. A [direct] democracy, consequently, must be confined to a small spot. A republic may be extended over a large region.” This passage *does* contain an argument:

- 1. In a [direct] democracy, the people meet and exercise the government in person.
- 2. In a republic, the people assemble and administer the government by their representatives and agents.
- 3. A [direct] democracy must be confined to a small spot, but a republic may be extended over a large region.

Example 5: “Israeli doctors have discovered that nation’s first known heterosexual transmission of the AIDs virus. *The Jerusalem Post* said the wife of a drug addict tested positive for the antibodies of the virus. Since the woman is not a drug addict or the recipient of a blood transfusion, the doctors believe that she probably was infected through heterosexual relations with her husband.” (Newspaper item). This is a *report*, not an argument. The passage reports a discovery made by Israeli doctors. It also contains a report of an argument: “Since the woman is not a drug addict or the recipient of a blood transfusion, she probably was infected through heterosexual relations with her husband.” However, this is not the news reporter’s argument. It is an argument apparently made by the doctors working on the case.

Example 6: This one is difficult. David Hume, in his *Dialogues Concerning Natural Religion*, writes,

Look around this universe. What an immense profusion of beings, animated and organized, sensible and active! You admire this prodigious variety and fecundity. But inspect a little more narrowly [closely and critically] these living existences, the only beings worth regarding. How hostile and destructive to each other! How insufficient all of them for their

own happiness! How contemptible and odious to the spectator! The whole presents nothing but the idea of a blind nature, impregnated by a great vivifying [life-generating] principle, and pouring forth from her lap [womb], without discernment or parental care, her maimed and abortive children.

This passage *is* argumentative, but what is the conclusion? In the *Dialogues*, Hume attacks arguments for the existence of God based upon the alleged order and design of the universe. In the foregoing passage, Hume is questioning (or even denying) the claim that the universe is a well-ordered product of intelligent design. His argument is something like the following:

1. If there were a God who is the creator and designer of the universe, then the world would be well-designed and well-ordered.
2. But our experience of nature shows us that it is full of defects and apparently purposeless disasters.
3. It is probable that nature is blind, unintelligent, and purposeless, and it is improbable that there is a God who is the creator and designer of the universe.

Example 7: Finally, here is an amusing *report* (not an argument) by Aristotle on the strange views and conduct of Cratylus, an extreme disciple of Heraclitus: “Cratylus, who finally did not think it right to say anything but only moved his finger, criticized Heraclitus [his teacher] for saying that it is impossible to step twice into the same river; for *he* thought one could not do it even once.” (*Metaphysics*, Bk. IV, Ch. 5). Aristotle is not arguing anything. He is simply *describing* Cratylus and his attitudes.

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Exercise 1.1 Which of the following are statements, and which are not? Explain.

1. Is Mount Everest the highest mountain in the world?
2. God cannot be a deceiver.
3. Please close the door.
4. Good golly, Miss Molly!
5. The Hudson River is longer than the Mississippi River.
6. Are human fetuses persons?
7. All knowledge derives from subjective experience.
8. Who is to say whether God exists or not?
9. Take these chains from my heart and set me free.
10. Socrates was indicted for religious heresy.

Exercise 1.2 Which of the following are arguments, and which are not? Explain.

1. If it rains, then I will carry an umbrella.
2. All spiders so far observed have been web spinners, so it is probable that all spiders are web spinners.
3. At his trial, Socrates proved that he was not an atheist.
4. It is raining, and I am not carrying an umbrella.
5. Logic, as we know it today, is mainly the study and analysis of statements and arguments, and it is especially concerned with evaluating the reasoning (or inference) that is contained in arguments. The purpose of logical analysis is to determine the differences (1) between correct and incorrect reasoning and (2) between “sound” and “unsound” arguments.
6. If we recognize some things as equal and some as unequal, then we must know what equality itself is. But, if nothing in our sense experience is the same as equality itself, either we don’t know what equality itself is or we don’t acquire this knowledge through sense experience. If we don’t acquire this knowledge through sense experience, then we were born having some knowledge. Since we do recognize some things as equal and some as unequal, it follows that we were born having some knowledge.
7. Either something exists at all times whether or not anything else exists, or else everything does not exist at some time and exists because something else exists. If everything did not exist at some time, then there would have been a time at which nothing existed. But if there was ever a time when nothing existed, nothing would exist now. Something exists now. Therefore, something exists that exists at all times and exists whether or not anything else exists. This something would be the same as God.
8. According to a basic rule of logic known as *the law (or principle) of non-contradiction*, a proposition “A” and a proposition “not-A” cannot both be true (or false) at the same time and in the same sense (or respect), or, to put it another way, “X” cannot be both “A” and “not-A” at the same time and in the same sense (or respect).
9. According to Aristotle, all humans are by nature political animals.
10. What is the basis (or what are the bases) of critical judgment in the arts (for example, the canons of unity, complexity, and intensity)? *Is* there any basis for art criticism? If not, why not?

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The Process of Argument Analysis and Evaluation

A thorough analysis and evaluation of an argument includes six operations or “steps.” The first three steps require us to (1) identify the conclusion of the argument (the

claim the arguer is seeking to prove true); (2) identify the premises of the argument; and (3) portray the formal structure of the argument.

Often, these three steps (which constitute an *argument analysis*) can be taken all at once. Consider, for example, the following argument: “The death penalty is murder because murder is a form of intentional homicide, and the death penalty is also a form of intentional homicide.” The formal structure of this argument is,

1. Murder is a form of intentional homicide.
2. The death penalty is a form of intentional homicide.²
3. The death penalty is murder.

In rewriting the argument in what we will call “*standard form*” (“step 3”), we have identified and distinguished between the conclusion (“step 1”) and the premises (“step 2”). We have now *analyzed* the argument. That is, we have identified (1) the conclusion and (2) the premises, and we have (3) portrayed the formal structure of the argument. We are now in a position to *evaluate* it.

Every argument makes two basic claims: *first*, that its premises are true; and *second*, that its conclusion follows logically from its premises. Let us call the first claim the *factual claim* in the argument and the second the *inferential claim*. An *argument evaluation* is a critical examination of these two claims in order to determine whether they are justified or not.

“**Step 4**” in the process of argument analysis and evaluation is a critical assessment of the factual claim in the argument; and “**step 5**” is a critical assessment of the inferential claim in the argument. If both claims are justified — i.e., if the argument’s premises are true and if the conclusion follows logically from them — then the argument is *sound*; and if one or both of these claims is unjustified — i.e., if it is *not* the case that all of the premises are true and/or if the conclusion does *not* follow logically from the premises — then the argument is *unsound*.

Let us, then, take steps 4 and 5 and evaluate the factual and inferential claims in the argument we have been considering. Beginning with the factual claim (“step 4”), we ask, “Are the premises true (as opposed to false or unconvincing)?” [It makes no logical difference whether one performs step 4 or step 5 first, so long as both steps are taken.] Both murder and the death penalty are forms of homicide, which is the killing of a human being. Moreover, neither murder nor the death penalty can be unintentional. Unintentional homicides (for example, manslaughter, negligent homicide) are not considered murders; and it seems extremely improbable (or even impossible) that the death penalty, which is a form of punishment for certain crimes (for example, murder), could ever be imposed unintentionally. So both premises are true. The *factual claim* in the argument is justified.

²The line between the premises and the conclusion represents the word “therefore.”

Next, we consider the *inferential claim* in the argument (“step 5”): Does the conclusion follow logically from the premises? No, it does not. The premises of the argument assert only one common characteristic of murder and the death penalty: they are both forms of intentional homicide. Although true, the premises do not take into account the significant differences between murder and the death penalty. A typical definition of murder is this: “premeditated criminal homicide perpetrated voluntarily, intentionally, and maliciously, and in wanton (or ‘cold blooded’) disregard for the value of human life.” Now, the death penalty is not illegal (as is murder), and it need not be carried out maliciously or in “wanton (or ‘cold blooded’) disregard for the value of human life.” Thus, while the premises of this argument are true as far as they go, the conclusion that the death penalty *is* murder does not follow from those premises.

As the foregoing two paragraphs illustrate, it is often necessary at step 4 and/or step 5 to clarify the terms and concepts used in an argument. In the argument under analysis, we have had to define “homicide” and “murder,” and we have had to distinguish between intentional and unintentional homicide as well as between murder and the death penalty. Some arguments may be stated so clearly that there is no question as to their meaning, but many arguments, such as the one we have been discussing, contain language that *is* in need of clarification.

“**Step 6**” in the process of argument analysis and evaluation includes a review and summary of our findings at steps 4 and 5 and a decision as to whether the argument as a whole is either *sound* or *unsound*. It is clear that the argument we have been considering is *unsound*: Its premises are true, but its conclusion does not follow logically from them.

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Exercise 1.3 For each of the following arguments, identify and distinguish between the conclusion and the premise(s).

1. The death penalty is morally justifiable only if it is an effective deterrent to the crime of murder or to other “capital” crimes. But the death penalty is not an effective deterrent to the crime of murder or to other “capital” crimes. Thus, the death penalty is not morally justifiable.
2. Since all knowledge comes from sensory impressions, and since there is no sensory impression of God, it follows that there is no knowledge of God.
3. All spiders so far observed have been web spinners. Therefore, the new species of spider discovered recently in Colorado spins webs.
4. Beliefs based solely on faith do not count as instances of knowledge, since knowledge is “verified true belief,” and since beliefs based solely on faith cannot be verified.
5. Smith will probably win the election because seventy-five percent (1,500) of the representative sample of 2,000 voters polled plan to vote for him.

Exercise 1.4 For each of the following statements or arguments, clarify all terms that are in need of clarification.

1. God cannot be a deceiver.
2. Abortion is morally wrong only if it violates someone's right to life. Non-persons do not possess a significant and protectable right to life, and human fetuses, although they are "human beings," are not "persons." Thus, it cannot be morally wrong for a pregnant woman to decide to have an abortion.
3. All humans are persons, and all persons are humans.
4. If God exists, then there is no pointless evil.
5. The death penalty is morally justifiable only if it is an effective deterrent to the crime of murder or to other "capital" crimes. But the death penalty is not an effective deterrent to the crime of murder or to other "capital" crimes. Thus, the death penalty is not morally justifiable.

Exercise 1.5 Portray the formal structure of the following arguments by rewriting them in standard form.

1. If there is one and only one first cause of all things, then its existence is necessary. If it is not the case that there is one and only one first cause of all things, then nothing could exist. But something does exist. There is one and only one first cause of all things, and its existence is necessary. Therefore, God exists.
2. Since all knowledge comes from sensory impressions, and since there is no sensory impression of God, it follows that there is no knowledge of God.
3. All spiders so far observed have been web spinners. Therefore, the new species of spider discovered recently in Colorado spins webs.
4. Beliefs based solely on faith do not count as instances of knowledge, since knowledge is "verified true belief," and since beliefs based solely on faith cannot be verified.
5. Smith will probably win the election because seventy-five percent (1,500) of the representative sample of 2,000 voters polled plan to vote for him.

Exercise 1.6 Are the following truth claims (statements) true or false? Explain.

1. All dogs are animals.
2. All knowledge comes from sensory impressions.
3. The world is ultimately good.
4. What the law does not expressly permit it forbids.
5. The universe is a machine.
6. The death penalty is morally justifiable only if it is an effective deterrent to the crime of murder or to other "capital" crimes.

7. The human fetus is a “human being,” but not a “person.”
8. All humans are persons.
9. All persons are humans.
10. AIDS is a highly contagious and fatal disease.
11. The existence of a perfect being (“God”) is either necessary or impossible.
12. There is pointless, purposeless, and meaningless evil in the world.
13. Angels exist.
14. If God exists, then there is no pointless evil.
15. Homosexual conduct is morally wrong only if it involves deception, promise-breaking, or exploitation of others.

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A possible misconception at step 6

To prove that an argument is unsound is not to prove that its conclusion is false. The conclusion of the argument we have been considering does not follow from its premises, and it also happens to be false (because murder and the death penalty are significantly different from one another). However, there are poorly reasoned arguments that *do* have true conclusions; for example,

1. All cats are animals.
2. All tigers are animals.
3. All tigers are cats.

Here, the conclusion happens to be true — all tigers *are* cats — but it does not follow logically from the premises (which happen also to be true). The reason for this is that the premises state only *one* thing that cats and tigers have in common, namely, that they are both animals. On the basis of this information alone, no one can correctly infer that all tigers are cats (or, for that matter, that all cats are tigers, which is false). The fact that two different classes of organisms both belong in the class of animals does not prove that there is any further relationship between the two. After all, dogs, zebras, kangaroos, and shrimp are animals too. Does that make any of them cats (or tigers)?

There is also the kind of argument in which the conclusion is true and does follow from the premises, but which is unsound because at least one of the premises is false. For example,

1. All dogs are animals (true).
2. All tigers are dogs (false).
3. All tigers are animals (true).

A third type of unsound argument is one that contains faulty reasoning *and* at least one false premise. An argument of this type might also have a true conclusion. For example,

1. If Ronald Reagan was once President of the United States,
then he is an officer of the federal government.
2. Ronald Reagan is an officer of the federal government.
3. Ronald Reagan was once President of the United States.

In this argument, both premises are false. The first premise is false because it is possible to serve as President of the United States and then return to private life, retiring from further governmental employment; and the second premise is false because Ronald Reagan has, in fact, retired from government service and is no longer a federal official. However, even if both premises were true, it does not follow that the conclusion is true because it is obvious that one might be a federal official without having been President of the United States. Nonetheless, the conclusion, as a matter of fact, *is* true.

Problems at steps 1 and 2: enthymemes

It is often difficult to identify the conclusion (step 1) and the premises (step 2) in an argument. One reason for this is that some (perhaps many) arguments are incompletely stated by their authors. Such arguments, technically known as *enthymemes*, are based on unstated but assumed premises or conclusions. (*En thymos*, in Greek [εν θυμος], means “in mind.” In an enthymematic argument, assumptions are held “in mind” by the author but are not stated explicitly.)

An enthymeme is not necessarily an unsound argument. Many speakers and writers assume, quite appropriately, that their audiences or readers understand many things that “go without saying.” Thus, for rhetorical purposes (for example, conciseness and psychological appeal), many arguments are presented with either suppressed premises or suppressed conclusions.

However, in analyzing an enthymeme, we must make all of its premises and its conclusion explicit in order to understand fully and clearly what the argument is saying. Consider the following examples:

- A. Socrates must be mortal because he is human.
- B. If pain exists, then God does not exist, and pain does exist.
You can draw the conclusion for yourself.

“A” asserts the conclusion that Socrates is mortal, and gives one reason (or premise) in support of that conclusion, namely, that Socrates is human. But the fact that Socrates is human does not prove that he is mortal unless all humans are mortal, which must be stated as a premise to give the argument full expression. “B” implies but does not state the

conclusion, “God does not exist.” A complete (non-enthymematic) presentation of the argument is:

1. If pain exists, then God does not exist.
2. Pain exists.

3. God does not exist.

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Exercise 1.7 Complete the following enthymemes.

1. Plato must be human because he is a Greek.
2. All tigers are cats, and all cats are animals. Draw your own conclusion.
3. Smith was permitted to vote in the last presidential election. Therefore, Smith must be a citizen.
4. Whenever the fear of inflation increases, the price of gold increases. The fear of inflation is now increasing.
5. If God existed, there would be no pointless evil. Therefore, the existence of God is improbable.

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Problems at step 5: the distinction between deductive and nondeductive arguments

We have seen that every argument contains an *inferential claim*. This claim is *not* that the argument’s premises are true (that is the work of the *factual claim* in the argument), but that the conclusion follows logically from the premises, *assuming* that they are true (i.e., *IF* the premises are true, then the conclusion must be true).

There are two different types of inferential claim. One is known as *deductive*, and the other is known as *nondeductive* (commonly called *inductive*). An argument containing a deductive inferential claim is known as a *deductive argument*, and an argument containing a nondeductive inferential claim is known as a *nondeductive argument*.

A *deductive argument* is one whose premises are claimed to *entail* (i.e., to provide *absolutely conclusive* support for the truth of) its conclusion, such that the truth of the conclusion follows with the force of *necessity* from the assumed truth of the premises. A *nondeductive (or “inductive”) argument* is one whose premises are claimed to offer strong (but not absolutely conclusive) support for the truth of its conclusion, such that, on the assumption that the premises of the argument are true, its conclusion is *probably* true. Clear examples of deductive and nondeductive arguments are as follows:

- A. If Polly is a cat, then she is an animal. Polly is a cat. Therefore, *it necessarily follows* that Polly is an animal
- B. The great majority of college professors are politically liberal, and Patricia Quinn is a college professor. So she is *probably* a political liberal.

We can see that “A” is deductive because it explicitly makes the deductive inferential claim that its conclusion “necessarily follows” from its premises; and “B” is nondeductive because it states that its conclusion “probably” follows from its premises.

Deductive arguments: valid or invalid

When the premises of a deductive argument entail its conclusion, the inference contained in the argument is described as *valid*; and when the premises of a deductive argument fail to entail its conclusion, the inference contained in the argument is described as *invalid*. Thus, a deductive argument contains a *valid* inference when it is *logically impossible* that the premises of the argument are true but its conclusion is false; and a deductive argument contains an *invalid* inference when it is *logically possible* that its premises are true while its conclusion is false.

The argument presented above, “If Polly is a cat, then she is an animal; Polly is a cat; therefore, it necessarily follows that Polly is an animal,” is *valid* because, if its premises are true, then it is logically impossible for its conclusion to be false, i.e., its conclusion *does* follow necessarily from its premises. The following argument, however, is *invalid*: “If Polly is a cat, then she is an animal; Polly is an animal; therefore, it necessarily follows that Polly is a cat.” Here, it is logically possible that the conclusion is false, even if the premises are true, since there are animals that are not cats. The conclusion does *not* follow necessarily from the premises.

Nondeductive arguments: strong or weak

The inference contained in a nondeductive argument is either *strong* or *weak*. A non-deductive argument contains a *strong* inference when, on the assumption that its premises are true, its conclusion is *probably true*. Such an argument contains a *weak* inference when, on the assumption that its premises are true, it *fails to establish the probable truth* of its conclusion. Here are two nondeductive arguments:

- A. Millions of crows have been observed, and all of them have been black. Therefore, it is probable that all crows are black.
- B. This die is marked with numbers 1 through 6. Therefore, it is probable that the next roll will turn up a 6.

The argument about crows appears to be a strong argument. If the premises are true, then the conclusion is very probably true. The argument about rolling the die, however, is weak.

There is a $1/6$ (16.67%) chance that a 6 will turn up on the next roll of the die, and a $5/6$ (83.33%) chance that it will not. On the basis of the information given in the premise, it is *improbable* (but possible) that the next roll of the die will turn up a 6.

The strength or weakness of a nondeductive inference is *a matter of degree* and is dependent on any *additional relevant information* that has not been given in the premises of the argument under consideration. Additional relevant evidence, embodied in additional premises, may either strengthen or weaken a non-deductive inference. For example, let us look again at the argument, “The great majority of college professors are politically liberal, and Patricia Quinn is a college professor; so she is probably a political liberal.” Assuming that the premises of this argument are true, is it probable that Patricia Quinn is a political liberal? That depends on *what else might be true about Professor Quinn*.

Suppose that, in addition to being a college professor, she is also a member of the Democratic Party, an officer of the American Civil Liberties Union (ACLU), and a fellow of the Brookings Institution. It is now *more probable* that she is a political liberal because many Democrats tend to be politically liberal, officers of the ACLU are very probably liberal, and the Brookings Institution is a liberal think tank. The argument has been *strengthened*.

However, suppose that she is not affiliated with the Democratic Party or the ACLU or the Brookings Institution, but rather that she is a member of the Republican Party, an officer of the American Conservative Union (ACU), and a fellow of the American Enterprise Institute (AEI). It is now *less probable* — indeed, extremely *improbable* — that she is a political liberal because the Republican Party tends toward political conservatism rather than liberalism, the American Conservative Union is obviously a conservative organization, and the AEI is a conservative think tank. The argument has been *weakened*. Thus, on the one hand, we can see that the following argument is considerably stronger than the original:

1. The great majority of college professors are politically liberal.
2. Patricia Quinn is a college professor.
3. Patricia Quinn is a member of the Democratic Party.
4. Patricia Quinn is an officer of the ACLU.
5. Patricia Quinn is a fellow of the Brookings Institution.
6. Many Democrats are politically liberal.
7. Officers of the ACLU are very probably politically liberal.
8. The Brookings Institution is a liberal think tank.
9. Patricia Quinn is probably a political liberal.

The premises of this expanded version of the original argument make it highly probable that Professor Quinn is, indeed, politically liberal.

On the other hand, the following argument is much, much weaker than the original:

1. The great majority of college professors are politically liberal.
2. Patricia Quinn is a college professor.
3. Patricia Quinn is a member of the Republican Party.
4. Patricia Quinn is an officer of the American Conservative Union.
5. Patricia Quinn is a fellow of the American Enterprise Institute.
6. Few Republicans are politically liberal.
7. Officers of the ACU are politically conservative, not liberal.
8. The AEI is a conservative think tank.

9. Patricia Quinn is probably a political liberal.

The premises of the foregoing argument make it *very improbable* that its conclusion is true.

The foregoing paragraphs reveal an important requirement of nondeductive logic: *For a nondeductive argument to be strong, its premises (assuming that they are true) must report enough evidence to make it probable that its conclusion is true.* This rule may be called *the requirement of sufficient evidence*. A nondeductive argument that fails to meet that requirement — i.e., even though its premises are true and offer some degree of support for the truth of the conclusion, they do not report *enough evidence* that is relevant to the issue at hand — must be judged *weak* rather than *strong*. On this basis, the original version of the argument about Patricia Quinn’s political inclinations appears to be weak, since its premises (“The great majority of college professors are politically liberal” and “Patricia Quinn is a college professor”) do not tell us enough about Professor Quinn to make it probable that she is a political liberal.

Deciding whether an argument is deductive or nondeductive

It is sometimes (but *falsely*) said, that the essential difference between deduction and induction (i.e., nondeductive reasoning) is that deductive reasoning moves from the general to the specific, whereas nondeductive inference goes from the specific to the general. There *are* deductive and nondeductive arguments that fit this description. However, there are *deductive arguments* that proceed *from the general to the equally general* (“No cats are dogs; therefore, no dogs are cats”); *from the specific to the specific* (“If Socrates is human, then he is mortal; Socrates is human; therefore, Socrates is mortal”); and *from the specific to the general* (“Either Socrates is not mortal, or all humans are mortal; Socrates is mortal; therefore, all humans are mortal”). Also, there are *nondeductive arguments* that proceed *from the specific to the specific* (“Jones is a philosopher and is wise; Smith is a philosopher and is wise; Cratylus is a philosopher; therefore, Cratylus is probably wise”); *from the general to the equally general* (“All past philosophers have been wise; therefore, it is probable that all future philosophers will be wise”); and *from the general to the specific* (“All colleges in New Jersey increased their enrollments this year; therefore, Rutgers University will probably increase its enrollment next year”).

The fundamental difference between *deductive* and *nondeductive* arguments was stated earlier. It lies in the nature of the *claims* these arguments make about the logical

relationship between their premises and conclusions. In a *deductive* argument, the arguer *claims* that the conclusion follows with *absolute logical necessity* from the *assumed truth* of the premises; whereas, in a *nondeductive* argument, the arguer *claims* that the conclusion follows with *probability* from the *assumed truth* of the premises.

In some arguments, the nature of the inferential claim being made is quite explicit and clear: for example, (1) “If all humans are mortal, and if Socrates is human, then *it necessarily follows that* Socrates is mortal;” and (2) “If ninety percent of all college student voters vote liberal, and if John Jones is a college student voter, then *it is probable that* John Jones votes liberal.” Here, the words “it necessarily follows that” tell us that the first argument is intended to be deductive, and the phrase “it is probable that” announces the nondeductive nature of the second argument.

Other arguments, however, do not make their inferential claims so explicitly and clearly. For example, the following three arguments contain no explicit “necessity” or “probability” language indicating the nature of their inferential claims:

- A. All redheads are quick-tempered, and Tim is a redhead; therefore, Tim is quick-tempered.
- B. Millions of crows have been observed, and all of them have been black; therefore, all crows are black.
- C. All dogs have tails, and all cats have tails; therefore, all cats are dogs.

Argument “A” is a *valid* argument. *If* the premises were true, the conclusion would also be true because it *follows with the force of logical necessity* from the *assumed truth* of the premises. The argument, therefore, must be deductive, since only deductive arguments can be valid.

The conclusion of argument “B” does not follow with absolute necessity from the assumed truth of the premises, but it *does* follow with a high degree of probability. So it seems fair to say that the argument is intended to be *nondeductive* (in which case it would be *strong*) rather than deductive (in which case it would be *invalid*). [According to a widely-recognized logical and philosophical rule known as *the Principle of Charity*, we owe it to our opponents to represent their arguments in nothing less than the best possible light.]

Argument “C” presents special difficulties. Its conclusion does not follow from its premises, but should we construe it as an invalid deductive argument or a weak nondeductive argument? On the one hand, if the argument had stated explicitly that the conclusion follows *necessarily* from the premises, then we could confidently state that it is an *invalid deductive argument*, since it is logically possible for an animal to have a tail and yet not be a dog. On the other hand, had the argument said that its premises make its conclusion *probably* true, then we could be sure that the argument was *nondeductive and weak*, since, merely on the assumption that two different classes of animals have tails, it

does not follow with any significant degree of probability that they have any further relationship with one another.

One way to handle an argument like “C” — an argument that cannot be clearly or easily identified as either deductive or nondeductive but that contains a faulty inference — is to treat it *both* ways: first, as a *deductive* argument, pointing out that, if it *is* deductive, then it is *invalid*; and, second, as a *nondeductive* argument, demonstrating its *weakness* as such. [See the discussion of the argument by John Stuart Mill, pp. 25-26, below.]

Deductive validity, nondeductive strength, and truth

As we have seen, the *inferential claim* in an argument is that the truth of its conclusion follows (either necessarily or probably, depending on whether the inferential claim is deductive or nondeductive) from the *assumed* truth of its premises. It is a mistake to assess the validity or invalidity of a deductive argument or the strength or weakness of a nondeductive argument on the basis of the *actual* truth or falsity of the argument’s premises. The reason for this is that it is the *logical form*, not the *truth content*, of an argument that makes it either deductively valid or invalid or nondeductively strong or weak.

The question about the inferential claim in a deductive argument is, “*If* the premises were true, would we be required, as a matter of logical necessity, to accept the truth of the conclusion?”; and the question with regard to a nondeductive argument is, “*If* the premises were true, would the conclusion, on that basis, be probably true?”

The following examples show that deductive validity and invalidity and nondeductive strength and weakness are *not* functions of the actual truth or falsity of the premises of deductive and nondeductive arguments, but rather of the *logical relationship* between the premises and the conclusion of an argument (whether deductive or nondeductive).

Valid and invalid deductive arguments

There are valid deductive arguments with true premises and a true conclusion:

1. All cats are animals.
2. All tigers are cats.
3. All tigers are animals.

There are also valid deductive arguments with false premises and a true conclusion:

1. All dogs are cats.
2. All tigers are dogs.
3. All tigers are cats.

There are also valid deductive arguments with false premises and a false conclusion:

1. All dogs have two heads.
2. All tigers are dogs.
3. All tigers have two heads.

There cannot be a *valid* deductive argument with *true premises and a false conclusion* because *if* the premises of a valid argument are true, then the conclusion *must* be true, since it follows with *absolute logical necessity* from the premises. Any deductive argument with *true premises and a false conclusion* is *invalid*:

1. All dogs are animals.
2. All tigers are animals.
3. All tigers are dogs.

In addition to invalid deductive arguments with true premises and a false conclusion, there are invalid deductive arguments with true premises and a true conclusion:

1. All cats are animals.
2. All tigers are animals.
3. All tigers are cats.

There are also invalid deductive arguments with false premises and a true conclusion:

1. All cats are dogs.
2. All tigers are dogs.
3. All tigers are cats.

There are also invalid deductive arguments with false premises and a false conclusion:

1. All dogs have two heads.
2. All tigers have two heads.
3. All tigers are dogs.

Strong and weak nondeductive arguments³

There are strong nondeductive arguments with true premises and a probably true conclusion:

1. All previous American Presidents were men.
2. Probably the next American President will be a man.

There are also strong nondeductive arguments with false premises and a probably true conclusion:

1. All previous candidates for the American Presidency used television advertising in their campaigns.
2. Probably the next set of candidates for the American Presidency will use television advertising in their campaigns.

There are also strong nondeductive arguments with false premises and a probably false conclusion:

1. All previous American Presidents were women.
2. Probably the next American President will be a woman.

There cannot be a *strong* nondeductive argument with true premises and a probably false conclusion. Any such nondeductive argument is weak:

1. A few American Presidents were Federalists.
2. Probably the next American President will be a Federalist.

There are also weak nondeductive arguments with true premises and a probably true conclusion:

1. Only two American Presidents were Federalists.
2. Probably the next American President will be a man.

There are also weak nondeductive arguments with false premises and a probably true conclusion:

1. A few American Presidents were Libertarians.
2. Probably the next set of candidates for the American Presidency will use television advertising in their campaigns.

³The sample nondeductive arguments in this section are either borrowed or derived from Patrick J. Hurley, *A Concise Introduction to Logic* (Belmont, CA: Wadsworth Publishing Company, 5th edition, 1994), p. 46.

There are also weak nondeductive arguments with false premises and a probably false conclusion:

1. A few American Presidents were Libertarians.
2. Probably the next American President will be a Libertarian.

* * * * *

Exercise 1.8 Which of the following arguments are deductive and which are nondeductive? Explain. If deductive, is the argument valid or invalid? Explain. If nondeductive, is the argument strong or weak? Explain.

1. If God existed, there would be no pointless evil. It seems that there is pointless evil in the world. Therefore, the existence of God is improbable.
2. Islam is a theistic religion. Professor Hasan is a Moslem. Therefore, Professor Hasan is a theist.
3. Murder is a form of intentional homicide. The death penalty is a form of intentional homicide. Therefore, it necessarily follows that the death penalty is murder.
4. Humans have the physiological properties P, Q, R, and S. Rats have the physiological properties P, Q, R, and S. Studies have shown that a significantly greater percentage of rats that had been given large quantities of saccharin developed bladder cancer than did those that had not been given any saccharin. Therefore, humans who consume saccharin are increasing their chances of developing bladder cancer.
5. All conduct that undermines the social order is morally wrong. Homosexual conduct does not undermine the social order. Therefore, homosexual conduct is definitely not morally wrong.
6. Smith will probably win the election because fifty percent (1,000) of the 2,000 voters polled plan to vote for him.
7. According to a recent poll, most students at Rutgers University are planning to vote for Jones. Therefore, most students at New Jersey colleges and universities are planning to vote for Jones.
8. Less than four percent of all Ruritanian-American college students are planning to vote for the liberal candidate. Mary is a Ruritanian-American college student. Therefore, Mary is not planning to vote for the liberal candidate.
9. All kangaroos have two heads, and all bats are kangaroos. Thus, all bats have two heads.
10. The college's baseball team wore its new red and white uniforms last Wednesday and won for the first time in five games. On Monday, they switched back to the old yellow and green uniforms and lost. So the team will probably win the next game if they wear the new uniforms.

A step 4 distinction: necessary and contingent statements

At “step 4” in the argument analysis and evaluation process, we critically assess the factual claim that the premises of the argument are true. Since the premises and the conclusion of an argument are statements, it is sometimes helpful to recognize the distinction between *necessary* and *contingent* statements.

Consider the following (valid) argument:

1. If George W. Bush is President of the United States, then he is an officer of the federal government.
2. George W. Bush is President of the United States.
3. George W. Bush is an officer of the federal government.

The first premise is true because, under the U.S. Constitution, the executive power of the federal government is vested in the President, and anyone serving as President is therefore an officer of the federal government. Thus, the premise is not merely factually true, but *necessarily* true. It *cannot* be false, given the provisions of the Constitution (and assuming the Constitution remains in effect or is not radically amended). Even if George W. Bush were not, in fact, President of the United States, the first premise of the argument would be true, since it says *if* he is President, he is a federal official.

The second premise, however, may be either true or false: Either George W. Bush is President of the United States, or he is not. It is a question of fact, not merely a matter of the logical meaning of the premise. If the second premise is true (as it is at this point in time), it is *contingently (not necessarily) true*; and if it is false (which it was prior to 2001 and will be at some future point in time), it is *contingently (not necessarily) false*.

Necessary statements

There are two types of necessary statements: (1) those that are *necessarily true* (also known as *tautologies*), and (2) those that are *necessarily false* (also known as *contradictions* or self-contradictory statements). A necessarily true statement *cannot* be false; and a necessarily false statement *cannot* be true.

The following are examples of necessarily true statements:

- A. Either angels exist, or they don't.
- B. All triangles have three sides.
- C. Every effect has a cause.
- D. If God would not permit the existence of pain and pain exists, then God does not exist.

It is *logically impossible* for any of these statements to be false. (A) To deny that angels either exist or not is to say that they both exist and do not exist, which is impossible. (B) To deny that all triangles are three-sided is to affirm that there are non-

three-sided triangles, which is also impossible, since triangles are *defined* as three-sided geometrical figures. (C) It is also logically impossible for an effect to have no cause, since the word “effect” (in this context) *means* “anything brought about by a cause or agent.” (D) Finally, the existence of God is impossible if we agree that pain exists and that God, if he existed, would not permit the existence of pain.

Here is a set of necessarily false statements:

- A. Today is Monday, and today is Friday.
- B. Polly is a cat, but she is not an animal.
- C. John’s siblings are all males, but Mary is John’s sister.
- D. George W. Bush is President of the U.S., but he is not an officer of the federal government.

These statements are necessarily false because it is *logically impossible for them to be true*, assuming that we are using our words in the standard or conventional ways. (A) A given day cannot be both Monday and Friday. (B) If Polly is a cat, then she must be an animal, because all cats are animals. (C) If John’s siblings are all males, then Mary cannot be his sister; and if Mary is John’s sister, then at least one of his siblings must be female. (D) It is impossible under the terms of the U.S. Constitution for a person to be President but not a federal official because, according to the Constitution, the President is the head of the executive branch of the federal government.

From the preceding analysis, it is clear that necessary statements are verifiable or falsifiable *by logical analysis alone* — i.e., by reference only to the logical meaning or to the logical form of the statement. This is known as *a priori* verification or falsification because it is either “prior to” or logically independent of factual (i.e., “empirical”) investigation. That is, once we understand the logical form or meaning of a necessary statement, we can then know whether it is true or false without any appeal to empirical evidence (i.e., evidence derived from sensory experience).

Some necessary statements can be known to be true or false *a priori* simply on the basis of their *logical form*. For example, (1) the statement “Either angels exist, or angels don’t exist” has the form “p or not-p” (“Either p is true, or not-p is true”); and (2) the statement “It is raining and it is not raining” has the form “p and not-p” (“Both p and not-p are true”). It is obvious from its form that (1) is necessarily true because either “p” is true or “not-p” is true; one of them must be true, and the other must be false; and they cannot both be true, since they contradict each other. Any statement (not only the statement about angels we are considering) that has the form “p or not-p” is necessarily true. It is also obvious that (2) has the contradictory form “p and not-p” and thus cannot be true, but rather must be false. Any statement that has the form “p and not-p” is necessarily false.

Other necessary statements can be known to be true or false *a priori* simply on the basis of the *meanings* of the key terms contained in them. Two of the statements discussed above were (1) “All triangles have three sides” and (2) “John’s siblings are all males, but Mary is John’s sister.” It is not the logical form of these statements but rather the

terminology they contain that lets us know that (1) is necessarily true and (2) is necessarily false. Since the word “triangle” *means* “a three-sided geometrical figure,” (1) must be true and cannot be false; and since “male sibling” *means* “brother” and “sister” *means* “female sibling,” (2) must be false and cannot be true.

As stated earlier, necessarily false statements are also known as *contradictions*. This is because they violate a basic rule of logic called *the law (or principle) of non-contradiction*, which says that a statement “A” (“angels exist”) and a statement “not-A” (“angels do not exist”) cannot both be true (or false) at the same time and in the same sense or respect, or, to put it another way, “X” (“today”) cannot be both “A” (“Monday”) and “not-A” (“Friday” or any day other than “Monday”) at the same time and in the same sense or respect. The truth of a self-contradictory statement is logically impossible, and its falsity is logically necessary.

We have seen that a necessarily true statement is such because it is logically impossible for it to be false. The falsity of a necessarily true statement is logically impossible because the denial or negation of a necessarily true statement is a contradictory (i.e., necessarily false) statement. If its negation is necessarily false, then its affirmation is necessarily true. For example, the negation of “Either it is raining, or it is not” is “It is both raining and not raining,” which is a contradiction, and, as shown in the preceding paragraph, a contradiction must be false and cannot be true.

We have also seen that a necessarily false statement is such because it is logically impossible for it to be true. The truth of a necessarily false statement is logically impossible because the denial or negation of a necessarily false statement is a necessarily true statement (a *tautology*). If its negation is necessarily true, then its affirmation is necessarily false. For example, the negation of “It is raining, and it is not raining” is “It cannot be both raining and not raining; or, to put it differently, it is either raining or not,” which is necessarily true.

So the negation of a necessarily true statement (a tautology) is a necessarily false statement (a contradiction); and the negation of a necessarily false statement (a contradiction) is a necessarily true statement (a tautology). We can state this rule more briefly in this formula: *The negation of a tautology is a contradiction, and the negation of a contradiction is a tautology*. That is why tautologies cannot be false and contradictions cannot be true.

Contingent statements

Contingent statements are neither necessarily true nor necessarily false, but may be, *in fact*, either true or false relative to observable facts, evidence, and/or circumstances. Such statements cannot be verified or falsified by logical analysis alone (i.e., on an *a priori* basis), but must be verified or falsified (if at all) on the basis of evidence derived from sensory experience. This is known as *a posteriori* verification or falsification because it is either “posterior to” or dependent (“contingent”) upon empirical investigation of the relevant facts, evidence, and/or circumstances.

The following are examples of contingent statements:

- A. There are rocks (i.e., rocks exist).
- B. Washington D.C. is the capital of the United States.
- C. Oranges are not grown in Antarctica.
- D. Unicorns exist.
- E. Abraham Lincoln is (now) President of the United States.
- F. There are palm trees growing on the moon.

On the basis of the evidence of experience, statements “A,” “B,” and “C” are thought to be true, and statements “D,” “E,” and “F” are thought to be false. However, “A,” “B,” and “C” *could* be false, and “D,” “E,” and “F” *could* be true. We can imagine or conceive of situations or circumstances in which “A,” “B,” and “C” would be false and in which “D,” “E,” and “F” would be true.

(A) It might be that my belief in the existence of the material world (and of rocks) is mistaken; perhaps the world is actually spiritual rather than material in nature, so that “rocks” (and other apparently material objects) are merely figments of my (unenlightened) imagination. [This “argument from illusion” could also be used to cast doubt on statements “B” and “C”. If the material world is an illusion, then there is no United States, no District of Columbia, no oranges, and no Antarctica.] (B) In the early days of the Republic, New York City was the capital of the United States; perhaps at some future time, the capital will be moved from Washington D.C. to another location. The federal capital was relocated before; it is not impossible that it could be relocated again. (C) Perhaps the U.S. government or a team of space aliens has created a special experimental environment in Antarctica in which farmers are now growing oranges. Thus, it is logically possible that statements “A,” “B,” and “C” are false, which proves that they are *not necessarily true* (although, on the basis of the available and relevant evidence, they are *probably true*). If they were necessarily true, then their falsity would be logically impossible.

Statement “D” appears false because there is no reliable empirical evidence for the existence of unicorns. However, the fact that unicorns have not been observed does not necessarily rule out their existence. It may be that they are unusually adept at hiding from human beings. Statement “E” is false *now*, but it *was* true in the early 1860s, which shows that it is *contingently but not necessarily false*. If it were necessarily false, then it would be a *contradiction*, and its truth would be *logically impossible* (i.e., it could *never* be true). Another possibility here is this: I may actually be living in, say, 1863 and merely *dreaming* that I am living in the year 2001 and that George W. Bush, rather than Abraham Lincoln, is President of the United States. As for statement “F,” the U.S. government or that team of space aliens may have been at it again, this time changing the climatic conditions on the moon and planting palm trees thereon. Thus, it is logically possible that statements “D,” “E,” and “F” are true, which proves that, although the evidence of experience shows them to be *probably false*, they are not *necessarily false*. If they were necessarily false, they would be self-contradictory, and their truth would be logically impossible.

Another (more formal) way to decide whether a given statement is *necessary or contingent* is to deny or negate it and then examine the negation to see whether it, itself, is a tautology or a contradiction. (1) If the negation of a statement is a necessarily false statement (a contradiction), then the statement that was negated is *necessarily true* (a tautology). (2) If the negation of a statement is a necessarily true statement (a tautology), then the statement that was negated is *necessarily false* (a contradiction). (3) If the negation of a statement is *neither* a necessarily false *nor* a necessarily true statement (i.e., neither a contradiction nor a tautology), then the statement that was negated is a *contingent* statement, which means that it may be either true or false, depending upon the relevant empirical evidence.

Earlier, we stated the rule, The negation of a tautology is a contradiction, and the negation of a contradiction is a tautology. We can now expand the rule as follows: ***The negation of a tautology is a contradiction, the negation of a contradiction is a tautology, and the negation of a contingent statement is neither a tautology nor a contradiction (but rather another contingent statement).***

A final point about the distinction between necessary and contingent statements: Any necessary statement can be proved either true (in case it is a tautology) or false (in case it is a contradiction) by way of logical, *a priori*, analysis of the statement's form or meaning. However, it is not always possible to verify or falsify contingent statements because they can be proved true or false (if at all) only *a posteriori*, i.e., on the basis of the evidence of experience, and in some (or perhaps many) cases, such evidence is unavailable. Thus, some contingent statements cannot *now* be verified or falsified (for example, "The Democratic candidate will win the next presidential election") because the requisite evidence is *not yet* available. Also, it seems that some contingent statements (for example, "Angels exist") cannot be verified or falsified *at all* because empirical evidence sufficient to prove or disprove such statements might *never* be available (at least, not in *this* world).

* * * * *

Exercise 1.9 For each of the following statements, state whether it is necessarily true (analytic, tautologous), necessarily false (self-contradictory), or contingent? Explain.

1. George W. Bush is President of the United States.
2. The universe exists.
3. The existence of a perfect being ("God") is either necessary or impossible.
4. Montana is the most beautiful state, and California is too!
5. Every effect has a cause.
6. Everything that exists must be caused to exist by something other than itself.
7. If a perfect being exists, then it must have been caused to exist by something other than itself.

8. The death penalty is not an effective deterrent to the crime of murder or to other “capital” crimes.
9. All triangles have three sides.
10. Life imprisonment is the most effective deterrent to the crime of murder, but the death penalty is even more effective.

* * * * *

Back to the Six Step Method

We have now discussed in some detail (1) the general nature of logic; (2) the problem of distinguishing between argumentative and non-argumentative writings and speeches; (3) the overall (“six step”) process of argument analysis and evaluation; (4) the fact that an unsound argument might have a true conclusion; (5) the handling of incompletely expressed arguments (“enthymemes”); (6) the distinction between deductive and nondeductive arguments; and (7) the differences between necessary and contingent statements.

Let us now return to the six step method and conclude this chapter by analyzing and evaluating several additional arguments. Here is an argument from John Stuart Mill’s *Utilitarianism* (1861):

The only proof capable of being given that an object is visible, is that people actually see it. The only proof that a sound is audible, is that people hear it: and so of the other sources of our experience. In like manner, I apprehend, the sole evidence it is possible to produce that anything is desirable, is that people do actually desire it.

[Step 1] Mill’s conclusion is that if something is desired, then it is desirable. [Step 2] He seeks to derive this conclusion from two premises: (1) If something is seen, then it is visible; and (2) If something is heard, then it is audible. [Step 3] The argument, rewritten in *standard form*, is as follows:

1. If something is seen, then it is visible.
2. If something is heard, then it is audible.
3. If something is desired, then it is desirable.

[Step 4] The premises of the argument are indisputably true. Obviously, the invisible cannot be seen, and the inaudible cannot be heard. That which is seen and heard must be visible and audible.

[Step 5] Although Mill’s premises are true, they do not require us to accept his conclusion. His argument draws an analogy: i.e., the desired is to the desirable as the seen is to the visible and as the heard is to the audible. The analogy, however, does not work.

Desirability is not analogous to visibility and audibility for the following reason: It is *impossible* to see the invisible and to hear the inaudible, but it is *possible* to desire the undesirable (for example, someone might desire to hurt innocent people). Mill's conclusion does not follow logically from his premises.

The problem is that the word “desirable” is ambiguous: it can mean “capable of being desired” or “worthy of being desired” — two very different senses of the word. Doing harm to innocent people is capable of being desired, but it is not worthy of desire: it is “desire - able,” but it is not “desirable.” One *can*, but *should not*, desire it. So the fact that it is *desired* does not make it *desirable*.

It is not clear whether Mill intended his argument to be deductive or nondeductive, but, either way, the *inferential claim* embodied in the argument is unjustified. If we interpret it as *deductive*, it is *invalid* because the conclusion does not follow necessarily from the premises; and if we interpret it as *nondeductive*, it is *weak* because the premises of the argument do not make the conclusion's truth probable.

[Step 6] Thus, Mill's argument is *unsound*. Although its premises are true, the inference in the argument is either invalid or weak. [Remember, to be *sound*, an argument must contain true premises and an inference that is either valid (if deductive) or strong (if nondeductive).]

Earlier, we considered the following argument:

1. If pain exists, then God does not exist.
2. Pain exists.

3. God does not exist.

This formal presentation of the argument [step 3] identifies and distinguishes clearly between the conclusion [step 1] and the premises [step 2].

This is a *valid* argument because the truth of the conclusion follows necessarily from the assumed truth of the premises [step 5 performed in this case prior to step 4]. If it is true that pain exists, and if it is true that God does not exist if pain exists, then it must be true that God does not exist.

As for the premises [step 4], the second (“Pain exists”) is obviously true, but the first is dubious. Why should the existence of pain rule out the existence of God? Since no definition of the word “God” is offered in the argument, we can assume that the word is being used in the traditional sense to refer to a Supreme Being that is (among other things) both all-powerful and perfectly good. The argument assumes that such a being could not allow pain to exist because it would be both willing (because it is all-good) and able (because it is all-powerful) to prevent the existence of pain. This assumption is subject to reasonable doubt: An all-powerful being would certainly be able to prevent the existence of pain, but an all-good being might permit (or even cause) pain to exist, since it is logically possible that pain (which, in itself, is often considered an “evil”) is necessary to

the achievement of a greater good (perhaps known only to God) that could not be achieved without the existence of pain. In fact, that is how *theists* (those who believe in the existence of God) usually explain the coexistence of pain and God. The first premise is therefore *unconvincing*.

[Step 6] The foregoing argument, then, does not prove the nonexistence of God. It is *valid* but *unsound* because, although its second premise is true, its first premise is unconvincing.

There are, of course, *sound* as well as *unsound* arguments. Let's examine a simple example: "All tigers are animals because all tigers are cats and all cats are animals." The logical form of this argument [step 3] is,

- 1. All cats are animals. [Step 2]
- 2. All tigers are cats. _____ ”
- 3. All tigers are animals. [Step 1]

[Step 4] The premises of this argument are true, as is obvious to anyone who knows what cats, tigers, and animals *are*. [Step 5] It is also obvious that the conclusion follows necessarily (i.e., validly) from the premises. If all cats are animals, and all tigers are cats, then all tigers *must* be animals. [Step 6] Since its premises are true and its inference is valid, the argument is *sound*.

Several other sound arguments have been presented at earlier points in this chapter. For example, the following *nondeductive* argument was presented earlier:

- [Step 3] 1. Millions of crows have been observed [Step 2]
- 2. All of them have been black. _____ ”
- 3. It is probable that all crows are black. [Step 1]

It *is* true that, of the millions of crows so far observed, all of them have been black [step 4], which makes it *highly probable* that *all* crows are black [step 5]. This is a *sound* nondeductive argument: it contains a *strong* inference, and the premises of the argument are *true* [step 6].

Why not try your own hand at the process of argument analysis and evaluation? Apply the six step method to the arguments from Shaw, Madison, and Hume presented above, or to any of the other arguments presented earlier in this chapter.

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By way of summary, here — again — are *the six steps*:

1. Identify the *conclusion*.
2. Identify the *premises*.
3. Portray the formal structure of the argument in *standard form*.
4. Evaluate the premises. Is each premise *true* (as opposed to *false* or *unconvincing*)? Why? Explain.
5. Evaluate the inference. If *deductive*, is it *valid* or *invalid*? If *nondeductive*, is it *strong* or *weak*? Explain.
6. Overall assessment. Review and summarize steps 4 and 5. Is the argument as a whole *sound* or *unsound*? Explain.

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Exercise 1.10 Which of the following arguments are sound, and which are unsound? Explain.

1. Homosexual conduct is morally wrong only if it involves deception, promise-breaking, or exploitation of others. But homosexual conduct does not necessarily involve deception, promise-breaking, or exploitation of others. Therefore, homosexual conduct is not morally wrong.
2. If there is widespread disagreement about what is “morally right” and “morally wrong,” then it is impossible to define the difference(s) between “morally right” and “morally wrong” conduct. There is widespread disagreement about what is “morally right” and “morally wrong.” It is therefore impossible to define the difference(s) between “morally right” and “morally wrong” conduct.
3. If God existed, there would be no pointless evil. It seems that there is pointless evil in the world. Therefore, the existence of God is improbable.
4. The death penalty is morally justifiable only if it is an effective deterrent to the crime of murder or to other “capital” crimes. But the death penalty is not an effective deterrent to the crime of murder or to other “capital” crimes. Thus, the death penalty is not morally justifiable.
5. All victims of highly contagious and fatal diseases should be isolated from society (quarantined). AIDS is a highly contagious and fatal disease. Therefore, all AIDS victims should be isolated from society (quarantined).
6. The sun will rise tomorrow because it has always risen every morning so far.
7. It is always right to tell the truth. Therefore, failing to tell the truth is never morally justifiable.
8. Whatever is pleasant is morally good. But hard labor is painful, not pleasant. Therefore, hard labor is morally bad.

9. All spiders so far observed have been web spinners, so it is probable that all spiders are web spinners.
10. Abortion is morally wrong only if it violates someone's right to life. Non-persons do not possess a significant and protectable right to life, and human fetuses, although they are "human beings," are not "persons." Thus, it cannot be morally wrong for a pregnant woman to decide to have an abortion.

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