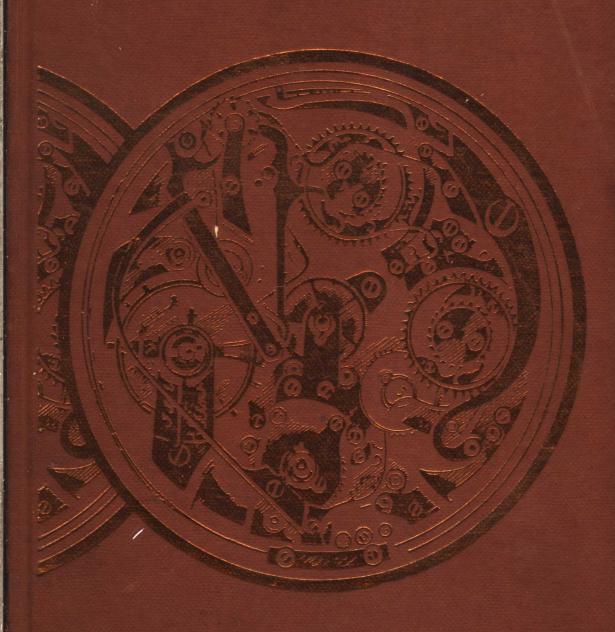# Logic and Philosophy

Fifth Edition

Kahane

Logic and Philosophy
A Modern Introduction
Fifth Edition

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Preface to
the Fifth Edition

The purpose of this fifth edition is the same as the first: to provide students with a clear, concise, comprehensible introduction to a complete system for sentential and first order predicate logic; the fundamentals of the traditional syllogistic logic; an empiricist account of the logic of scientific inference; and related material on logic and philosophy. This great variety of material (more than in any other introductory logic text) enables instructors to choose topics of most interest to them and best suited to their students.

This fifth edition includes many minor improvements and several major revisions:

1. The chapter on probabilities has been completely revised so as to make it more comprehensible and up to date—much new material has been added (for example, concerning Bayes' Theorem and Dutch books).

2. Chapters on modal, epistemic and deontic logics, removed from the third edition, have been restored in response to popular demand.

3. The improved chapter on scientific method includes new material on Popper's falsification theory and Goodman's "new riddle of induction".

4. A section on Christine Ladd-Franklin's antilogisms has been added to Chapter Eleven.

5. The direct coupled tree method has been added to the chapter on the tree method for proving validity.

6. A section has been added to Chapter Five on adding new valid argument forms to the system.

7. Some of the material from the fourth edition has been moved to new, more appropriate locations (for instance, the material on logical paradoxes has been moved to Chapter Nine, and the material on truth trees from an appendix to Chapter Seventeen).

8. Seventeen new exercise sets have been added, containing hundreds of new exercise items.

The key to understanding logic is still the same. The student who fails to grasp the material (assuming modest effort) almost always does so because of a failure to understand the difference between variables and constants and thus between sentence forms and sentences. That is why Exercise 2-2 is still the most important one in the book. (Failure to grasp the idea of truth functionality is the next most important reason for failure to grasp the material in general.)

Contents

To Art, Betsy, Charles, Don, Edward,
Frank, George, Harry, and . . . Nancy!

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1 *Reasoning and Arguments*

Consider the following simple example of reasoning:

> Identical twins often have different IQ test scores. Yet such twins inherit the same genes. So environment must play some part in determining IQ.

Logicians call this kind of reasoning an **argument.** (But they don't have in mind shouting or fighting. Rather, their concern is *arguing for* or presenting reasons for a conclusion.) In this case, the argument consists of three statements:

1. Identical twins often have different IQ test scores.
2. Identical twins inherit the same genes.
3. So environment must play some part in determining IQ.

The first two statements in this argument give *reasons* for accepting the third. In logic talk, they are said to be **premises** of the argument, and the third statement is called the argument's **conclusion.**

In everyday life, few of us bother to label premises or conclusions. We usually don't even bother to distinguish one argument from another. But we do sometimes give clues. Such words as *because, since,* and *for* usually indicate that what follows is a premise. And words like *therefore, hence, consequently, so,* and *it follows that* usually signal a conclusion. Similarly, expressions like "It has been observed that . . . ", "In support of this . . ." and "The relevant data . . ." generally introduce premises, while expressions like "The result is . . . ," "The point of all this is . . . ," and "The implication is . . ." usually signal conclusions. Here is a simple example:

> *Since* it's wrong to kill a human being, *it follows that* abortion is wrong, *because* abortion takes the life of (kills) a human being.

In this example, the words *since* and *because* signal premises offered in support of the conclusion signalled by the phrase *it follows that*. Put into textbook form, the argument reads:

1. It's wrong to kill a human being.
2. Abortion takes the life of (kills) a human being.
/∴ 3. Abortion is wrong.*

(Of course, an argument may have any number of premises and may be surrounded by or embedded in other arguments.)

But not all groups of statements form arguments. Only those do that provide *reasons* for believing something. Thus, anecdotes are generally not arguments, nor are most other forms of *exposition* or *explanation*. It's important to understand the difference between rhetoric that is primarily expository or explanatory and rhetoric that is basically argumentative. A passage that contains only exposition gives us no reason to accept the "facts" in it other than the authority of the writer or speaker, whereas passages that contain arguments allege to give reasons for some of their claims (conclusions) and call for a different sort of evaluation than merely an evaluation of the authority of the writer.

Examples:

Here are some examples of groups of statements that do not constitute arguments:

1. Wow! Indian food sure is hot. Pass the water pitcher.

2. Every time something goes wrong around here, people blame me. Wonder what it's like in other offices.

3. Well, our vacation was just great. We flew to Paris. Then we went over to Vienna, Budapest, Bucharest, and then Athens, before flying back to the States. All in ten days. What a wonderful trip.

Exercise 1-1

Here are twelve passages (the first six are from student papers and exams, modestly edited). Determine which contain arguments and which do not. Label the premises and conclusions of those that do, and *explain*

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* The symbol "/∴" is used to indicate that a conclusion follows.

your answers. Paraphrase if that makes things clearer. (Even-numbered items in most exercise sets are answered in a section at the back of the book.)

1. I don't like big-time college football. I don't like pro football on TV either. In fact, I don't like sports, period.

2. My summer vacation was spent working in Las Vegas. I worked as a waitress at the Desert Inn and made tons of money. But I guess I got addicted to the slots and didn't save too much. Next summer my friend Hal and I are going to work in Reno, if we can find jobs there.

3. Well, I have a special reason for believing in big-time college football. After all, I wouldn't have come here if Ohio State hadn't gone to the Rose Bowl, because that's how I heard about this place in the first place.

4. At the present rate of consumption, the oil will be used up in 20–25 years. And we're sure not going to reduce consumption in the near future. So we'd better start developing solar power, windmills, and other "alternative energy sources" pretty soon.

5. The abortion issue is blown all out of proportion. How come we don't hear nearly as much about the evils of the pill? After all, a lot more potential people are "killed" by the pill than by abortion.

6. I've often wondered how they make lead pencils. Of course, they don't use lead, they use graphite. But I mean how do they get the graphite into the wood? That's my problem. The only thing I can think of is maybe they cut the lead into long round strips and then cut holes in the wood and slip the lead in.

7. Punishment, when speedy and specific, may suppress undesirable behavior, but it cannot teach or encourage desirable alternatives. Therefore, it is crucial to use positive techniques to model and reinforce appropriate behavior that the person can use in place of the unacceptable response that has to be suppressed.

   —Walter and Harriet Mischel, *Essentials of Psychology*

8. There was no European language that Ruth could not speak at least a little bit. She passed the time in the concentration camp, waiting for death, by getting other prisoners to teach her languages she did not know. Thus did she become fluent in Romany, the tongue of the gypsies.

   —Kurt Vonnegut, *Jailbird*

9. How do education and training affect lifetime income? Are they worth their cost? The evidence answers, decidedly yes. Men who never finish eight grades of school earn scarcely $3,800 annually; college graduates do three times as well. Unemploy-

ment among school dropouts exceeds that of graduates by a growing margin.

—Paul Samuelson, *Economics* (7th ed.)

10. There are two main reasons why someone might buy a six-month bank certificate instead of going for the higher yields of a money-market fund. The first is that these certificates are insured by an agency of the federal government. The second is that a certificate enables you to lock up your 9 percent, or whatever rate you are getting for the next six months.

—Richard Blodgett, *McCall's* magazine

11. A senior Soviet editor said yesterday that Mikhail Gorbachev plans to attend the U.N. General Assembly session in September, an occasion that could provide an opportunity for a meeting with President Reagan. . . . No official announcement has been made of Gorbachev's plans, and diplomats in Moscow cautioned that the Soviet leader could alter them if conditions changed. But the *Pravda* editor was quoted as saying: "I know for sure that Mr. Gorbachev will go to the General Assembly session".

—*San Francisco Chronicle*, 23 April 1985

12. You can choose to fight them in the morning—they'll kill you or enslave you. You can choose to hide from them—they'll find you. Or you can take their victory from them. They will remember you.

—ABC dramatization *Masada*

2 Deduction and Induction

There are two basic kinds of good arguments or reasonings. The first kind are often called *deductively valid* arguments or *valid deductive* arguments or simply *valid* arguments, and the second kind *inductively correct, inductively strong,* or *inductively valid* arguments.

The fundamental property of a **deductively valid argument** is this: *If all of its premises are true, then its conclusion must be true also.* To put it another way, if all of the premises of a deductively valid argument are true, then its conclusion *cannot be false.* The truth of its premises "guarantees" the truth of its conclusion.

The question naturally arises as to why the premises of a deductively valid argument, if true, guarantee the truth of its conclusion. Unfortu-

nately, no easy answer can be given.* Perhaps the best we can say at this point is that the information contained in the conclusion of a deductively valid argument is already "contained" in its premises. We are not usually aware of this fact, because it is usually contained in the premises implicitly, along with other information not contained in the conclusion.

Examples:

We know that if the premises of the deductively valid argument

1. If Bonny had her appendix out, then she doesn't have to worry about getting appendicitis.
2. Bonny had her appendix out.

/∴ 3. She doesn't have to worry about getting appendicitis.

are true, then the conclusion (sentence 3) must be true also. For in asserting that if Bonny had her appendix out, then she doesn't need to worry about appendicitis (premise 1) *and* that Bonny has in fact had her appendix out (premise 2), we implicitly assert that Bonny doesn't have to worry about appendicitis.

Here is another example:

1. All wars are started by miscalculation.
2. The Vietnam conflict was a war.

/∴ 3. The Vietnam conflict was started by miscalculation.

Having said in the first premise that all wars are started by miscalculation, and in the second that the Vietnam conflict was a war, we implicitly say that the Vietnam conflict was started by miscalculation.

Good inductive arguments are said to be **inductively correct,** or **inductively strong.** Unlike the case of deductively valid reasoning, an inductively strong argument does not guarantee that if its premises are true then its conclusion must be true also. An inductive argument, however strong, only provides good, never conclusive evidence in support of its conclusion. At best such an argument only makes its conclusion *probable,* never certain, no matter how much supporting evidence it presents.

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* Indeed, we cannot give an answer acceptable even to a majority of philosophers. In philosophy, fundamental questions such as this one tend to be the most controversial. In Parts One and Two of this text we shall avoid taking sides in such controversies whenever this can be done without seriously affecting the intent and validity of the material presented.