World Video Bible School®

Established 1986

L O G I C

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LOGIC

☙ Syllabus ❧

1. GENERAL INFORMATION.

(1) Instructor: Mac Deaver (Ph.D., Christian Doctrine and Apologetics).

(2) This course consists of 9 lessons on 3 SP videotapes (or, 2 PAL videotapes).

(3) Each class is approximately 38 minutes long.

2. DESCRIPTION AND PURPOSE.

(1) This course is an introductory study of logical deduction.

(2) It is designed to give a working knowledge of some of the basic principles of deductive logic.

(3) It will help in understanding our obligation to God to reason correctly.

(4) It will help us prepare to defend the truth and expose false reasoning.

(5) It will help in understanding the composition and use of logical arguments.

(6) It will help us see the importance of the law of rationality.

3. INSTRUCTIONAL MATERIALS.

(1) Required.

A. Bible (ASV, KJV, or NKJV).

B. 9 video lessons.

C. Course notes in spiral bound book.

D. *Logic And The Bible* by Thomas B. Warren. Moore, Oklahoma. National Christian Press, 1982 (available from World Video Bible School).

4. MEMORY WORK.

(1) Memory verses must be written (or typed) from memory, then mailed to VBI for grading. Verses must come from the ASV, KJV or NKJV, according to what you indicated on your original VBI application.

(2) All verses must be written out or typed at one sitting. You may study more and start over if you make a mistake, but you must still start again from the beginning and write all the verses at one sitting.

(3) For *Logic*, the following verses must be memorized:

- Isaiah 1:18
- Acts 17:11
- Romans 12:1
- 2 Corinthians 13:5
- 1 Thessalonians 5:21-22
- 1 Peter 3:15
- 1 John 4:1

(4) Memory work is due when you mail VBI your written test.

(5) Hint: A good method of memorizing is to write the verses on flash cards that can be easily reviewed throughout the course.

5. TESTS.

(1) There is one comprehensive written test at the end of the course.

(2) When you near the last lesson, contact us and request the *Logic* test.

(3) When you receive the test, you have permission to look at it and study it prior to taking it.

(4) However, when you actually take the test, you must do so completely from memory, with no help from notes, Bible, textbook, or tapes.

(5) The test will cover material from both the spiral bound class notes, as well as the textbook by brother Warren.

6. BOOK REVIEW.

(1) Write a book review of *Logic And The Bible*, by Thomas B. Warren. In your review, briefly describe the purpose of each chapter from 1-16. The review should demonstrate that you have read the book and understood its content. Put the review in your *own* words—do not just copy from the book.

(2) The paper should be a minimum of four pages, typed and double spaced. If handwritten, the paper should be a minimum of six pages, single spaced.

(3) The paper is due when you mail VBI your test and memory work.

7. GRADING.

(1) Memory work, book review, reading assignment and test will be graded separately.

(2) Final grade is based on an average of all assigned work, with the written test counting twice.

(3) You may request that a grade be explained or reconsidered, but in any dispute VBI will have the final say.

8. REVIEW OF REQUIREMENTS.

(1) Read *Logic And The Bible* by brother Warren in its entirety.

(2) Read the class notes in their entirety.

(3) View each video lesson in its entirety.

(4) Complete all memory work.

(5) Write a book review.

(6) Take one written test.

(7) Have a combined grade average of at least 70.

9. CREDIT.

(1) Credit will be issued, including a certificate, only after all work has been successfully completed, tapes have been returned (if rented), and all invoices for this particular course have been paid in full.

(2) Thank you for studying in the Video Bible Institute and we pray it is a blessing to your life on your way to eternity. Don't hesitate to call or write with any question or problem.

WORLD VIDEO BIBLE SCHOOL
LOGIC

STUDENT CLASS NOTES

INTRODUCTORY MATTERS:

These notes are typed just as they appeared in the book entitled, Logic, an Introduction, by Lionel Ruby. This book was originally published by J.B. Lippincott Company, but it is no longer in print.

The notes are taken from Part II of the book which begins with Chapter Six. For continuity and clarity, the chapter numbers have been left as they appeared in the book. Finally, please keep in mind that Mr. Ruby was not a New Testament Christian.

PART TWO - DEDUCTIVE LOGIC

CHAPTER 6

LOGIC AND ARGUMENT

Section I: Argument and Assertion

In Part Two we shall study the principles of valid reasoning, i.e., the principles which determine whether an argument is sound or unsound. Since the argument is the fundamental unit of reasoning, our first task is to un-derstand the nature of argument.

The word "argument" is used in more than one sense. In popular speech "argument" often refers to a contest in reasoning, to a dispute, a wrangle, or a battle of ideas. Such arguments are contentious;each arguer tries to "win." In logic, however, the term argument refers to the basic unit of reasoning and we define it as "a unit of discourse in which beliefs are supported by reasons."

An argument is a unit of discourse which seeks to prove that something is or is not the case. Here is an example: "You can't vote at the next election, for you aren't registered, and only those who are registered can vote." This argument undertakes to prove that you can't vote at the next election, and related reasons are presented in support of this point. Note that every argument contains two parts: (1) a point, or belief, or thesis, usually called the "conclusion" of the argument and (2) the supporting reasons or evidence, usually called the "premises." The premises are the facts or assumptions on which the conclusion of the argument is based.

It is important to distinguish an argument from a "mere assertion." The French essayist Montaigne once said that "to philosophize is to learn how to die," i.e., that a wise man will not fear death. This is a mere assertion as it it stands. But Montaigne weaves this assertion into the conclusion of an argument when he gives his reasons for his belief. The argument goes as follows:

"A wise man will not fear the loss of life, for it is foolishness to fear the loss of something one can never regret having lost." The conclusion is stated before the comma; the rest is the supporting reason or premise. The argument is the whole. A statement becomes a premise or conclusion by virtue of the role it plays in the argument.

An argument is discourse containing inference, in which we say "This is so because of that," or "This is so; therefore that is so." The student should seek to acquire facility in distinguishing the conclusion from the premises of arguments. There are two questions he should ask himself whenever he encounters argumentative discourse: (1) What is the writer's point, i.e., exactly what is he trying to prove or "put across"? (2) What reasons does he present to support his point? These questions concern only the structure of the argument and not its adequacy or inadequacy. Questions concerning the soundness of arguments will be discussed later.

An argument, then, has two parts, premises (or evidence) and conclusion. Note that the order of these parts is immaterial. The conclusion may be stated first, last, or it may be sandwiched between the evidence. The three possibilities follow:

1. Evidence stated first...*therefore*...conclusion.
2. Conclusion stated first...*because*...evidence.
3. Part of evidence...*therefore* conclusion...*because* remainder of evidence.

The following arguments are respective examples:

1. All men are mortal, and Socrates is a man; *therefore* Socrates is mortal.
2. Socrates is mortal *because* all men are mortal, and Socrates is a man.
3. All men are mortal; *therefore*, Socrates is mortal *because* he is a man.

These forms state exactly the same argument, despite the difference in the arrangement of its parts. Most arguments contain *logical indicators*, i.e., words which signal that a part of the argument is premise or conclusion. "Because" and "therefore" are such indicators. These words have many synonyms. Synonyms for "therefore" are words like "so," "hence," "consequently," "thus," which always introduce the conclusion of the argument. This function may also be performed by phrases such as "which indicates that," "which shows that," "we may conclude that," "must be," and so on. Synonyms for "because" are words like "for," "since," or phrases like "in view of," or "for the reason that," etc. Remember that "because" and its synonyms always introduce a premise.

Some arguments contain no logical indicators, as in "We are headed for socialism. Congress just voted big subsidies for farmers." The speaker obviously intends the second sentence to be evidence for the first. The logical indicators may also indicate subsidiary elements rather than the main conclusion in an argument. But the student who is alert to the presence of the indicators will have little difficulty in distinguishing the premises and conclusion of an argument.

Exercises

Read the units of discourse stated below, and distinguish collections of mere assertions from arguments. Are beliefs alone stated, or are reasons given for the beliefs? Identify "logical indicators" where present. If the unit is an argument, analyze it into two parts, evidence and conclusion, and restate it with the conclusion first (Form 2 above).

1. All men are mortal and fallible, so some mortal beings are fallible.
2. Since only citizens can vote, John must be able to vote, for he is a citizen.
3. If a man is able to vote, then I know that he must be a citizen. John must be a citizen, for I know that he can vote.
4. Good sense is of all things the most equally distributed among men; for everybody thinks himself so abundantly provided with it that even those most difficult to please in all other matters do not commonly desire more of it than they already possess. (Descartes)
5. There are thousands of persons on the federal payroll who don't earn their pay but who are kept on until they can retire. The commission studying this matter may recommend that these workers be let off with adequate severance pay.
6. All men are mortal and fallible. All men are sinners.
7. The following excerpts are from a speech delivered by General George Marshall, former Secretary of State and author of the Marshall Plan, in Chicago, Illinois, on November 18, 1947:
   (a) It seems evident that as regards European recovery, the enlightened self-interest of the United States coincides with the best interests of Europe itself and of all those who desire to see conflicts of whatever nature resolved, so that the world can devote its full attention and energy to the progressive improvement of the well-being of mankind. The place to begin that process is in Europe.
   (b) We recognize that our people will be called upon to share their goods still in short supply and will have to forego filling a portion of their own requirements until the greater needs of Europe have been met. This is a direct contradiction of the allegation that we are seeking to dump surplus foods in Europe in order to avoid the depressing effects of oversupply.
8. There is no race in the whole world that consists of families of uniform character. Every race embraces many diverse family lines. It is incorrect to assume that all the members of a racial group possess uniform characteristics because they are similar in some respects. All people who are blond and who have blue eyes have not the same characteristics and there is no reason to give inordinate weight to this single feature. (From "remarks" by Franz Boas in a pamphlet, 1934.)
9. The first condition of free government is government not by the arbitrary determination of the ruler, but by fixed rules of law, to

which the ruler himself is subject. We draw the important inference that there is no essential antithesis between liberty and law. On the contrary, law is essential to liberty. (L. T. Hobhouse, *Liberalism*, Henry Holt.)

10. Human beings do not live "by bread alone"; they also need to dream, to have great hopes and aspirations. This is especially true of today's teenagers, who are so accustomed to modern luxuries that they no longer thrill to material possessions.

Modern parents no longer have dreams. They now possess what they used to dream about. They have split-level ranch homes, picture windows, finny automobiles, and automatic dishwashers.

This is the reason why today's parents have so little influence over their teenagers.

Section II: The Law of Rationality and Evasions Thereof

We have distinguished arguments from mere assertions. An argument is discourse containing inference, in which we say, "This is so because of that." But the inference may be sound or unsound. In Part Two we will be concerned with the principles of sound reasoning. Before proceeding to the principles, however, let us consider the aim of logical thinking and the manner in which this aim may be frustrated.

Every person who is interested in logical thinking accepts what we shall call the "law of rationality," which may be stated as follows: *We ought to justify our conclusions by adequate evidence.* The meaning of adequacy will be explained in detail as we proceed. Let it suffice here to say that by "adequate evidence" we mean evidence which is good and sufficient in terms of the kind of proof which is required. There are occasions when we require conclusive proof, as in mathematics, and there are occasions when it is sufficient to establish the probability of a given conclusion, as in weather prediction. But in all cases the evidence must be adequate to its purpose.

Adequate evidence is evidence which is relevant to the conclusion to which it is directed. We need not define "evidence" or "relevant," since we may assume that these words will be generally understood by most persons. Unless the meaning of these words were understood by the reader of a book on logic prior to his reading the book, he would not be able to follow the author's reasoning. The reader must be warned, however, that "relevance" is not always easily determined. When we say that one fact is relevant to another, we mean that there is a connection of some kind between them. This connection is not always apparent. For example, a historian investigating the causes of the decline and fall of the Roman Empire must consider only matters relevant to his study. Should he study the history of the building of the Great Wall in China, and the practice of human sacrifice among the Aztecs? Both facts may appear irrelevant, but we find to our surprise that the first fact is relevant. For the Great Wall was built to keep the Huns out of China, and they turned west instead. In their travels for pillage and loot they finally came to the Roman Empire and had an important role in its destruction. But all of us understand what relevance means. When one fact is irrelevant with respect to another, then that fact, like "the flowers that bloom in the Spring," has "nothing to do with the case."

Though few, if any, will have the temerity or the foolishness to challenge the law of rationality, it is often evaded. Evasion usually occurs through carelessness, but it may also occur through design. In this section we shall note some of the typical ways in which the obligation to support beliefs by adequate evidence is evaded.

In every argument we find the assertion of a belief, which we shall call "P," (for "probandum," or proposition to be proved). Someone says that P is true. When we ask the speaker, "Why," or "What reasons do you have for believing that P is true?" we ask for evidence. We then expect adequate evidence to support his belief. This adequate evidence should be relevant to the question at issue, and it should be good and sufficient evidence. In the rest of this chapter we shall be concerned with the *evasion* of the requirement that evidence be furnished. The proverb says that we asked for bread and were given stones. Paraphrased, we shall find that we asked for evidence and received the Argumentum ad Misericordiam, or the Argumentum ad Hominem, or the Argumentum ad Verecundiam. We turn now to the evasions, seven of which will be considered.

1. The Appeal to Authority

This evasion has the following structure: Jones says that P is true. When asked, Why? he answers, "Because X says so." Now, P *(the probandum)* should be proved by adequate evidence, but the fact that X says it is true is not *evidence* for its truth. The citing of authority in this bald manner is an evasion of the law of rationality.

Now, to say that "the appeal to authority" is an evasion of the law of rationality is not to say that we are guilty of this evasion whenever we cite an authority for our beliefs. There is no doubt that sensible people must rely on authorities for many, if not most, of their important decisions and for the beliefs on which these decisions are based.

When a physician tells us that we need an operation we rely on his authority. We accept the authority of the weatherman that rain is probable. We have neither the time nor sufficient knowledge to investigate the evidence for all of our beliefs. The point, however, is this: No belief is true merely because someone says so. It is true because of the evidence in its behalf. When we trust an authority, we merely place credence in the fact that he has evidence. And if we wish to *know*, rather than merely to believe, we should inquire into the evidence on which his conclusions are based. For example, the reader believes that the earth is in motion. On what evidence?

In general, three questions should be kept in mind when considering the statements of an authority: Is the cited authority an authority in the specific field in which he has made his pronouncements? Does the authority have evidence to prove his statements? Do all qualified investigators agree on the general soundness of the type of proof offered? A great physicist may be an authority in the field of nuclear physics, but that does not qualify him to be dogmatic in the field of religion. A man may be very critical in one field and very uncritical in another. A theologian may be an authority in the field of theology, but he is not necessarily an authority on the question of the existence of God, since not all qualified investigators are agreed on the soundness of his methods of proof. On the other hand, we accept the statements of astronomers that the mean distance of the sun from the earth is close to 93 million miles, because they are authorities with respect to such matters, their evidence is available to all, and all qualified investigators agree on the soundness of their methods. We accept our physician's statement that we should take medicine for our ailments for similar reasons (or at least we believe these reasons to hold). But even the acceptance of competent authority is never a substitute for *proof*.

When the authorities are in conflict, i.e., when "the doctors disagree," two courses of action are open to us. If the problem is a purely theoretical one, and we are not required to take immediate action, we should suspend judgment. If action is required, we should accept the authority who appears to be most competent and trustworthy.

The appeal to authority is often called the "Argumentum ad Verecundiam," a learned-sounding Latin phrase which means the "appeal to reverence." A revered authority or tradition is often regarded as infallible, so that anyone who disagrees is in some sense disloyal to that which ought to be revered. This type of appeal is sometimes employed with respect to the theory of evolution. We may be told that evolution cannot be true because it is contrary to the story in the Book of Genesis. But this question must be decided by those who have examined the available evidence, and the writers of that ancient book did not possess our present knowledge. Reverence is not a substitute for evidential proof. Reverence was also exhibited by the mediaeval professor who looked through Galileo's telescope, but who continued to teach the ancient astronomical ideas because he preferred to distrust the evidence of his senses rather than doubt the authority of Aristotle.

The fact that "everybody knows that this is so" is no proof. The masses of men have frequently been mistaken. They once thought that the earth was flat. They still believe that the speed of a falling object depends on its weight. The voice of the people is not necessarily the voice of God on all questions.

2. The Appeal to Emotion

The structure of this evasion: "The proposition 'P' is true." Why?- "Because I (or you) have strong feelings concerning it." But strong feelings do not constitute evidence for the truth of a proposition. The fact that people have emotional attachments to religious and political doctrines does not make the doctrines true.

The appeal to emotion takes two forms, one subjective or personal, and the other objective or social. In its *personal* form the appeal is to one's own emotions. A person is convinced of the truth of a proposition because he "cannot bear to think it untrue." If I feel so strongly about it, his argument goes, then it surely must be true. But wishes are fathers to thoughts, and this is an evasion of the law of rationality. The argument is usually not stated in this bald manner, but it is often found in a concealed form.

In the *objective* form the appeal is to the emotions of other persons, as when a speaker substitutes emotional appeals for evidence. In traditional logic this is called the "Argumentum ad Populum," the appeal to the people, or, in less flattering terms, to the mob. The masses of men are often moved by emotion rather than by reason. Speakers inflame crowds of people with emotionally loaded language, rabble-rousing and prejudiced appeals, by spell-binding, "pulling the heart strings," and appeals to popular sentiment. But the truth is not always one with our emotions. Mark Anthony's speech, part of which was quoted in Chapter 4, is an excellent example of the use of this evasion. It is Mark Antony's task to convince the mob that Caesar was not a dictator. His argument, reduced to its structural elements, goes as follows: If Caesar's wounds are pitiful to behold, then Caesar could not have aspired to be a dictator. If Caesar remembered you in his will, then he did not aspire, etc. Emotion overcomes reason, but again, no evidence.

Mark Antony's speech is also a good example of a special variety of the appeal to emotion called the "Argumentum ad Misericordiam," or the "appeal to pity." This appeal is used by attorneys for the defense who tell the jury that the prisoner at the bar has a wife and four small children. It was this type of argument which Socrates disdained to use in his speech defending himself to the Athenian jury, as reported in Plato's *Apology*. Finally, we note the "appeal to laughter." This means that we meet an opponent's arguments, not by evidence, but by a joke, to arouse laughter at his expense and to divert the attention of the hearers from the issue. But laughter, like loud talking, is never a substitute for evidence.

A warning is called for before we leave this evasion. We have not said that all emotional appeals are inappropriate. When the facts are not in question and action is desired, and emotional appeal is appropriate, even indispensable. In the critical days of 1940 when England was threatened with invasion Prime Minister Winston Churchill's emotional eloquence inspired his people and spurred them to heroic efforts. What must be condemned is the substitution of emotion for proof when proof is required.

3. The Argumentum ad Hominem

The Latin title means "an argument directed to the man," to the man (speaker, writer), that is, instead of to the point at issue. For example, let us suppose that we disagree with what a speaker says. We may try to disprove what he says by presenting contrary evidence. But sometimes we don't bother to present the evidence. Instead, we try to disprove what the speaker says by attacking *him*, (verbally, of course).

This evasion is a form of *disproof*, rather than *proof*. It seeks to show that a certain proposition is false but substitutes an attack against the speaker for an attack against the proposition itself. Its structure: "P is false." "Why is P false?" Because he who asserts P is a certain kind of person."

It may be instructive to contrast the "ad hominem" with the "appeal to authority." There is a sense in which these are opposites, for in the latter we say "P" must be true because X says it is. In the "ad hominem" we say "P" must be false because X is a certain kind of person. The ad hominem argument, in other words, has a negative purpose: to discredit a proposition by discrediting the speaker. It is an evasion of the law of rationality because it fails to provide relevant evidence against the proposition it seeks to disprove.*

To illustrate. A woman reads Schopenhauer's *Essay on Women,* aptly described by G. K. Chesterton as "that hideous essay." Schopenhauer writes:

> It is only the man whose intellect is clouded by his sexual impulses that could give the name of the fair sex to that undersized, narrow-shouldered, broad-hipped, and short-legged race: for the whole beauty of the sex is bound up with this impulse. Instead of calling them beautiful, there would be more warrant for describing women as the unaesthetic sex. Neither for music, nor for poetry, nor for fine art, have they really and truly any sense or susceptibility; it is a mere mockery if they make a pretense of it in order to assist their endeavor to please. Hence, as a result of this, they are incapable of taking a purely objective interest in anything.

And more of the same. He says that women are interested only in acquiring husbands, in dress, jewelry, and cosmetics. Now, practically all women and most men would disagree with Schopenhauer. But how does the "typical" woman reader meet Schopenhauer's argument? By pointing out that his statements are untrue, or highly misleading in their selectivity? No. She attacks Schopenhauer himself, stating that he must have been a disappointed lover or that he must have had a very unhappy childhood to write such tripe. But this attack does not meet his argument. "Attacking the man" is an evasion of the law of rationality, and it is not a proper substitute for presenting evidence to refute his argument.

In general, the "ad hominem" takes the form of directing one's attack toward the speaker rather than to what he has said. The implied assumption is that his being a certain kind of person, or having a certain personal history, tends to make his statements false. Thus we answer an opponent by noting that he is a millionaire or a poor man, as the case may be, young or old, an employer or a member of a labor union. The popularity of the "psychoanalytic" method in recent years has made this method of approach a common one. Instead of meeting an opponent's arguments with evidence we seek to psychoanalyze him. If he says that a strong government is desirable, then we find that he is seeking a substitute for a "father-image." If he thinks a weak government is desirable, then he is in revolt against his father-image.

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* Note that "ad Hominem" is sometimes used in a different sense - for an argument based on an appeal to a person's private prejudices. "You, as a property owner, will surely oppose building a new high school, for this will mean higher taxes."

Note how this approach seems to discredit whatever view it seeks to "explain." In general, we employ this psychological approach only for views with which we disagree, for it seldom occurs to us to seek a psychological explanation, or any explanation at all, for what seems obvious to us. One who takes the psychological approach thus usually assumes the falsity of the view he seeks to explain. It is as if the speaker were to say, "Your ideas are so patently false that it is difficult to see how an intelligent man could assert such things. So there must be a psychological explanation." But if we believe that ideas are false, then we are duty-bound to present the evidence. A pejorative psychological analysis of the supposed psychological causes of a belief is no substitute for logical analysis. Indulging in "personalities" is irrelevant with respect to the logical force of ideas. Euclid's geometry stands or falls on its own merits, whether or not Euclid was a kind husband and father.

We should not confuse the ad hominem with an attack against a man's character. If we say that Roe is a liar, or dishonest, or a spy, we have made allegations which may be false and slanderous, but the ad hominem does not occur unless we contend that Roe's *statements* must be *false* because Roe is a certain kind of person. This distinction should be borne in mind when considering a special variety of the ad hominem called "Poisoning the Wells." This figure of speech refers to the demand that we should suspect or ignore whatever some people may say on the ground that the truth cannot be in them. "Do not drink water from that well," it is said, "for the well is poisoned." In practice, this takes the form of an attack which seeks to discredit a witness, by alleging that he is a dishonest witness. This is sometimes a legitimate procedure, provided that we do not confuse this kind of an attack with a disproof of what the speaker says. This important distinction requires careful analysis.

We do *not* commit the ad hominem evasion when we attack a person's character, as when we say that he is a liar and should not be trusted. Thus in a law court a witness for the prosecution testifies that he observed the defendant in the act of committing the crime. The attorney for the defense then presents "character witnesses" who testify that the witness is a notorious liar who has been previously convicted of perjury. This evidence proves that the witness is untrustworthy, and that his testimony is of little worth with respect to its credibility. A jury will be reluctant to accept his statements at face value and will probably disregard his evidence. But liars sometimes tell the truth, and we should not confuse proof that a witness is untrustworthy, with proof that what the witness is now saying is false. We also discredit a speaker when we find that he has been paid to give his testimony, that he is an apologist for special interests or groups, that he is notoriously biased or prejudiced, or that he is insincere, and so on. If we know that a person is a communist, and as such would never find any fault with Russia, his statement that Russia is right in a particular international dispute would carry little weight. In the same manner we discount a Republican's attacks against a Democratic administration, and vice versa, because we feel that such criticisms are apt to be prejudiced. But in none of these examples have we proved that the speaker's statements are false.

We also seek to discredit a speaker when we accuse him of being inconsistent, but this is not to prove his last statement false. For example, ex-Governor Arnall of Georgia once stated that he thought it inadvisable to outlaw the Communist Party. An opponent retorted, "But Governor, a year ago you favored outlawing this party." The Governor answered that he had reconsidered, and now believed it would be a mistake to suppress ideas with which he disagreed. The fact that the Governor was inconsistent did not prove that he was now wrong (or right). But when we find a person consistently inconsistent, then we lose respect for his mental quality and integrity, and in such cases he becomes a discredited witness. Though we may admire people who have sufficiently flexible minds to change their opinions with new evidence, we do not admire those whose opinions change, like weather vanes, with every shift in the winds of doctrine. But though an attack against a man's authority may be legitimate, we must never confuse this with an attack against the ideas he has expressed.

A similar distinction must be made when we read a history of ideas. When a historian gives us a sociological or a socio-political-economic interpretation of ideas, he "explains" how a particular thinker came to develop his system of thought. For example, Thomas Hobbes (1588-1679) advocated the principles of absolute monarchy in his *Leviathan*. It is highly enlightening to know that Hobbes was personally a rather timid man. Perhaps he desired the security which a strong king would give him. We may also learn that he wrote in a time of troubles, when the social situation was disorganized and chaotic and when men longed to escape the horrors of civil war. The historian may explain how the principle of absolute monarchy reflected the social needs of the time. But insofar as Hobbes presented a reasoned defense of his principle for *any* society, then his argument must be met with logical criticism as well as sociological interpretation.

The same considerations apply to John Locke's (1632-1704) defense of constitutional monarchy. Locke was an apologist for the reign of William and Mary, the constitutional monarchs who ascended the throne in 1689 at the invitation of the English Parliament. But Locke's argument for the advantages of representative government can also stand on its own feet. Edmund Burke (1729-1797) was a liberal in his early career. The French Revolution aroused a horror of revolution in him and he became an extreme conservative, arguing that social reform was certain to cause more harm than good. But once again, our knowledge of the conditions which led him to this position do not in themselves invalidate the argument. It may be that Burke's psychological experiences gave him an insight which he had not previously had.

The value of the historical explanation of ideas is that it may call into question our unthinking acceptance of assumptions which appear to be eternally valid. The critical mind welcomes a questioning of first principles. "Truth" is a very complex matter in the field of political philosophy, and history reveals that most political ideas play a very practical role in organizing society under certain historical conditions. Nevertheless, political programs are also general techniques for achieving certain universal goals, and as such their validity transcends their immediate historical setting.

Before we leave this topic we shall note a popular type of defense against the ad hominem attack. We may defend ourselves against an ad hominem by our own ad hominem, directed against its proponent. This type of defense is called the "tu quoque," which means "You're another." An illustration: X, a forty-year-old professor argued in favor of the military draft in 1949. He stated that it was necessary for the defense of the nation. A student interposed, "You favor the draft because you are in the higher age bracket and are not in danger of being drafted." The professor responded with his own ad hominem in the form of the tu quoque, "By the same token, you are against the draft merely because you are afraid that you will be drafted." The question at issue in this discussion was: Is the draft necessary for the welfare of the country? The tu quoque settles nothing, but is a useful rhetorical device to expose the evasion called the ad hominem. Similarly, if we told that we believe in the truth of P merely because we have been "conditioned" in a certain way, the proper retort is that our opponent considers P false merely because *he* has been conditioned in a different way. We shall usually find that those who use the ad hominem seldom realize that it may be applied to themselves. Thus, a Marxian sees the doctrines of classical economics as false, "since they are merely products of a special historical situation," but the Marxian economics is regarded as infallibly true and not as the mere product of a historical situation. But the critic may be hoisted with his own petard.

4. Argumentum ad Ignorantiam

This means the "appeal to ignorance." It has the structure: "P is true." Why? "Because you can't disprove it." This type of evasion often occurs in discussions which involve religious faith. Thus a man may argue that the Book of Genesis gives a literal account of the creation of the world. A skeptic may state that this account appears improbable to him, though he may also admit that he cannot disprove it. The religious protagonist then asserts, "You must now admit that it is true, for you cannot disprove it." This is the appeal to ignorance or inability to disprove. But inability to disprove is not equivalent to proof. Only evidence gives us proof. If we accepted this kind of substitute for evidence we should be required to believe that the Angel Gabriel visited the prophet Mohammed to inform him that God had decided that the Moslem religion was to supersede the Jewish and Christian religions. For how would you go about disproving this claim? We are not required to accept the improbable merely because we do not know how to disprove it. As cautious thinkers, we will withhold belief until we have positive evidence in favor of a proposition.

5. Begging the Question

This evasion, known in traditional logic as "Petitio Principii" consists in our pretending to prove something when actually we *assume* in the "proof" that which we are supposed to prove. "Why do I believe that Zilch is guilty? Because he is guilty." The evasion has the following logical structure: "P is true." Why? "Because P is true." The "evidence" here merely restates the conclusion. There is thus no independent relevant evidence whatsoever; we have merely assumed the truth of that which we are supposed to prove. The conclusion is used to establish itself.

This evasion is seldom stated in this bald form. The fact that we use the conclusion to establish itself is usually concealed in various ways. X argues that it is wrong for women to sit at bars. When asked, Why? he answers, "Because I know that it isn't right." The expression "wrong" and "not right" are equivalent to each other. "Arguing by definition" usually involves begging the question. Thus, X asserts that all Christians are virtuous men. Y then points to the example of Thwackum, who is a Christian, but no exemplar of virtue. "Ah," answers X, "Thwackum may attend his church regularly, but he is no Christian, since, if he were, then he would be a model of virtue." This is begging the question by definition, since X has *defined* a Christian as a virtuous man. Thus his statement "All Christians are virtuous men" was a mere statement of the tautologous remark that "All virtuous men are virtuous men." This is certainly true, but it is no proof that "Christians," in the sense of "being a member of a Christian church," are all virtuous men. The original proposition appeared to be a significant statement only because the implied tautology was concealed.

Question-begging may also occur independently of arguments. Statements may assume matters that ought to be proved, as in the use of "question-begging epithets" such as "stupid conservatism," or "wild-eyed radicalism," or in referring to a person on trial as "that criminal." Complex questions (Have you stopped beating your wife?) also "beg the question" by assuming that which ought to be proved.

Though we should not assume what needs to be proved, some assumptions are indispensable in any discussion. The careful thinker is one who tries to be aware of his assumptions. Few of us, however, are capable of exercising the care shown by a cautious man who was famous for never saying anything he was not sure of. While driving through the country with a friend they passed some sheep. "Those sheep seem to have been sheared recently," said his friend. "Yes," answered the cautious man, "at least on one side." Charles Lamb, the English essayist, was also a careful man. He is reported to have refused to admit that 2 plus 2 is 4 until he knew what use would be made of his admission.

"Reasoning in a circle" is a "drawn-out" form of begging the question. It contains intermediate steps. The conclusion is used to establish itself, but it is smuggled into a chain of reasons rather than into only one. A fairly complicated example: The founder of a new religion tells us that he is inspired, so that we may believe whatever he tells us (P). When challenged for proof he presents us with a book which states that he speaks in God's name (Q). "Why should we believe this book?" we ask. "Because it comes from God (R), he answers. "But how can we know this?" we persist. "Because you can take my word for it (S)." "And why should we take your word?" "Because I am inspired (P)." If we should now ask, "How can we know that you are?" the circle will start all over again.

The structure of this argument may be shown in schematic form:

Assertion that P is true. Proof: Because Q is true. (Question: How do we know Q is true?)

Proof that Q is true. Because R is true. (Question: How do we know R is true?)

Proof that R is true. Because S is true. (Question: How do we know that S is true?)

Proof that S is true. Because P is true. (But this is what we started out to prove!)

6. Diverting the Issue

The law of rationality requires that we furnish evidence for or against the proposition in issue and not for some other proposition. The evasion we call "diverting the issue" takes the following structure: P is true (or false) because I can prove R (where the truth of R is irrelevant to the truth of P). This evasion is seldom found in this obvious form, for usually R bears some superficial resemblance to P, and it may appear that we have proved P when we have proved R.

An example: In 1940, the "isolationist" chancellor of a leading American University argued against the proposal that the United States should send military aid to England during the early stage in the World War. He sought to prove his point by the rhetorical questions, "Do you think that a victory for the British Empire will result in the disappearance of all of the ills which afflict us here at home?" and "Are we to help British Empire every time it goes to was?" His argument boils down to the following: We should not help England (P) because I can prove that such action will not result in a Utopia (R), or We should not help England (P) because I can disprove the thesis that we should help England whenever England goes to war (R). But what the chancellor should have proved was that it was not in the interest of the United States to help England in 1940. His evidence should have shown (if such evidence were available) that we would have been better off by not helping England at that time. The wise man will always choose the better when he cannot get the best.

Another example: A group of law students were discussing the abilities of the various members of the freshman class. One of them insisted that Littleton, a student whose class recitations contained frequent references to Schopenhauer, Nietzsche, and other philosophers, was a true genius. His friends turned upon him with withering scorn and the challenge, "A genius! What possible basis is there for calling him a genius?" "Well," came the immediate response, "he's no fool!"

In debates this type of diversion is of frequent occurrence. One of the debaters may seek to divert the issue to one which his opponent will find more difficult to prove or to one which he can more easily prove. X asserts that "all corporation executives are opposed to labor unions," and then adduces evidence to prove that it would be absurd to believe that "all corporation executives are friendly to labor unions." But the proof of the falsity of the second proposition does not prove the truth of the first. Certainly it is not the case that *all* executives are friendly, for some are and some are not. But this is quite different from saying that none of them are friendly.

Similarly, if X asserts that "some executives are friendly," Y may then seek to prove that it is false to assert that "all are friendly." But Y is not disproving the falsity of X's statement; he is disproving a different one. This type of diversion is called an "extension," since it extends the opponent's statement beyond what was actually asserted.

7. Special Pleading

We ought to furnish adequate evidence for our beliefs, and this means that we ought to state the evidence as fairly and completely as it is possible to do so. To deliberately select evidence which is favorable to our thesis and to conceal unfavorable evidence is to violate this law. Few human beings are capable of perfection in this matter. Charles Darwin was an outstanding example of a thinker who conscientiously sought to find all the possible evidence which might upset his theory and who candidly admitted the gaps in his account of the evolution of life. At the opposite pole we find the fabled geologist who worked out a highly original theory concerning the rock formations in a certain valley. The examined evidence confirmed his theory, and he was in a state of exultation over the sensation which his paper would make in scientific circles. He walked up a hill to enjoy "his" valley, when his eye fell on a large boulder, a type of rock which should not have been there if his theory were true. He thereupon put his shoulder to the boulder and pushed it down the other side of the hill!

"Special pleading" is the evasion committed by speakers or writers who carelessly or deliberately overlook "negative" facts. The following is an example: "The New Deal of the early thirties was a disaster. It unbalanced the budget, increased the national debt, passed unconstitutional legislation, etc, etc." This argument tells us that the New Deal was a disaster "because of the following list of facts..." But this listing of evidence, whether true or not, is very one-sided. No mention is made of facts on the other side. Its structure: "P is true." Why? "Because of the following list of facts: Q, R, and S." But facts A, B, and C, which might tend to disprove P, are ignored, either carelessly or deliberately.

The term "special pleader," however, should not be used for those who merely fail to state the evidence completely, for complete evidence is often an unattainable ideal. Outstanding examples of this evasion are found in political debates where each side claims all the credit and finds nothing but ill in its opponent's records. Lawyers are also notorious special pleaders, since their chief purpose is to win the case rather than to find the truth. Witnesses in a law court who swear under oath are required to testify to the truth, the whole truth, and nothing but the truth. This is obviously a precaution against special pleading. Each part of the affirmation is necessary. Otherwise the witness might tell the truth part of the time and lie the rest of the time. He could then say that he had told "the truth," but not "nothing but." Or he might tell only the truth but leave out a substantial part of it. Thus the requirement that he tell the "whole truth."

Exercises

A. The following group contains examples of each of the evasions of the law of rationality. The correct answers are found at the end of this set, but the student should attempt to identify each example before looking up the answers. The seven evasions are the following:

(1) The appeal to authority (Argumentum ad Verecundiam).
(2) The appeal to emotion.
  (a) The appeal to one's own emotions.
  (b) The appeal to the emotions of others (Argumentum ad Populum ad Misericordiam, Appeal to Laughter).
(3) The Argumentum ad Hominem (Poisoning the Wells).
(4) Argumentum ad Ignorantiam.
(5) Begging the Question (Reasoning in a Circle).
(6) Diverting the Issue (Diversion, Extension).
(7) Special Pleading.

In each case find the proposition (P) in issue. Show the structure of the evasion in the following way: "P is true (or false) because..." Then state the nature of the evasion.

1. Your argument that the Taft-Hartley Law has contributed to labor unrest is without merit, since you are an International Representative of the CIO and would therefore be against the act no matter how good it was.
2. A wholesaler sued a retailer for $200, claiming that he had shipped that amount in goods to the defendant and had not been paid. The retailer claimed that he had paid the bill. The wholesaler-plaintiff stated that he had no record of the payment. The retailer-defendant then said that the court should dismiss the case, since the plaintiff could not disprove his claim that he had paid the bill.
3. Every slip of the tongue is significant in that it reveals some unconscious and suppressed desire. There can be no question about the truth of this statement, since it was put forward by Sigmund Freud, the founder of psychoanalysis.
4. Henry, a determinist, believes that human beings have no free will. He argues that in all choices between two courses of action, the strongest impulse will prevail, i.e., that the strength of the impulse decides the issue, not the "will." How do we know that the strongest impulse always prevails? By the very fact that it prevailed.
5. I feel that if we don't prevent the establishment of life tenure for the Chief Executive, the republic eventually will be undermined and destroyed. The New Deal is the height of totalitarian nationalism. Our Republican tradition is based upon uncompromising independence and the interests of the republic. (Alfred M. Landon, 1941.)
6. Jones says that he is in favor of an army draft at the present time. Smith: "But why? We are not at war." Jones: "This is a period of crisis." Smith: "Well, so far as I am concerned, I favor the time-honored constitutional way of doing things." Jones: "But in time of national crisis we must disregard the constitution."
7. Under the capitalistic system there are many poor people,

there is waste of men and materials, cut-throat competition, the glorification of the acquisitive instinct, depressions on the one hand and inflation on the other. This proves that the system is thoroughly bad and should be discarded.

The above arguments may be analyzed as follows:

1. "The proposition: 'The Taft-Hartley Law has contributed to labor unrest (P)' is a false proposition because you are a certain kind of person." Ad Hominem.
2. "I paid the $200.00 (P). This is true, since you cannot disprove it." Ad ignorantiam.
3. "Every slip of the tongue is significant because Freud says so." Freud was a great psychologist, but scientific psychologists still debate the truth of many of his theories. In any case, what is the evidence for this probandum? Ad Verecundiam or appeal to authority.
4. P: "The strongest impulse always prevails (hence no free-will)." How do we know that it does? "Because it does." This is begging question.
5. These are highly "loaded" remarks. President Roosevelt had just been re-elected to his third term, but "life tenure" is a figment of the imagination. "The height of totalitarian nationalism" is an inflammatory rather than an informative description of the New Deal. Mr. Landon had a point, but he submerged it in emotive language. His probandum is not clear, but it seems to be "You ought to vote Republican." Appeal to emotion.
6. This is an example of a diversion. The question is whether it is right that "we should have an army draft at the present time (P)." Smith diverts the issue to "the constitutional way of doing things," and Jones falls into the trap. (The draft is constitutional.)
7. Highly selected and one-sided facts to prove that "capitalism is bad (P)." Special pleading.

B. Analyze this group as before. Each type is represented by one example.

1. The attorney for the defense handed his brief to the barrister with the written notation, "We have a very poor case. Abuse the plaintiff's lawyer." Which evasion was he recommending?
2. "Educated people do not believe in the devil." "But I know some college graduates who do." "I said *educated* people; the college graduates you refer to aren't really educated, because if they were, then they wouldn't believe in the devil."
3. How do we know that this man is guilty of having committed this well-planned crime? I have encountered many examples of crime in my experience, but never one so well-planned as this one. Consider the circumstances of this crime carefully, and I am sure that you will agree with me that it was unusually well-planned.

4. Since it is impossible to prove that immortality is false, there being absolutely no positive evidence against it, we may rest assured in the confident belief that our souls are immortal.
5. Religion brought intolerance into the world, denied freedom of thought, retarded scientific progress, and was a divisive influence in that it separated group from group, each creed believing that it alone was good and all others bad. Therefore religion has done more harm than good.
6. Why do I think the Demlican party is the best? Because that is the way my father voted.
7. I know that there will never be an atomic war because I just couldn't bear to think about what will happen to the human race if there is such a war.

C. Identify the evasions in the following and explain your answers. State the probandum in each case.

1. But, Doctor, surely your advice that I should cut down on my smoking for health reasons cannot be sound, since I see that you yourself are a chain smoker.
2. Vivisection is wrong because it is wrong to dissect living animals for experimental purposes.
3. Free enterprise is not as good a system as socialism. I need only point out to you that free enterprise does not work perfectly. There are losses as well as profits, depressions as well as booms. Letting everyone decide things for himself will not result in a perfect state.
4. *Open the door, Richard* must be the greatest song ever written. No other song ever became so popular in so short a time, and since music is written for the public, what the public approves of must be the best.
5. Modern art is greater than traditional art because all the best critics say so. Who are the best critics? You can identify them by the fact that they prefer modern art to traditional art.
6. Our senator is about the worst we ever had. I just can't stand his sanctimonious manner and his preaching to other countries in a holier-than-thou manner. And I feel like screaming whenever I hear that he is making another junket to Europe.
7. Russia has real freedom, and capitalism allows no freedom. What proof do I have? Because, by definition, capitalism enslaves the workers.
8. What does this child psychologist know about raising children! He doesn't even have any children of his own.
9. ELMER: I oppose all forms of imperialism, both the Russian type and the type represented by the Marshall Plan.
   PHIL: But the Marshall Plan is not imperialism in the usual sense of that term.
   ELMER: Oh, so you think that the Marshall Plan represents a policy of pure benevolence on the part of the United States?
10. Every human being believes in God whether he admits it or not,

for this belief is universal in the human race.

11. The universe must have had a beginning. There have been many philosophers and scientists during the last 2,000 years who have tried to prove that the universe had no beginning. It is generally agreed that not one of these "proofs" will stand up.
12. PARENT: If you expect to graduate from college you will have to put more time in your studies.
    SON: In other words you want me to give up all my social and athletic activities and do nothing but study from morning until night!
13. Dromedary cigarettes are without question easiest on the throat and most healthful. Our private statistical researches prove beyond doubt that more doctors smoke Dromedary than any other brand.
14. "Crime is a disease." "Well, but how about J.P., the headwaiter, who went to jail for income tax evasion? He seemed like a normal man to me." "Oh, he was sick, very sick." "But how do you know that?" "By the very fact that he committed a crime, for crime is a disease."
15. This witness is not telling the truth for he was convicted of perjury some years ago.
16. I would not hire X as a professor at this University. I have reason to believe that he is a communist.
17. Segregation must prevail, for it can be proved scientifically that human beings differ in all sorts of ways.
18. We'll give this here hoss thief a fair trial, but send to town for a good strong rope.
19. A Chicago newspaper commented as follows on ex-President Truman's statement that "we won that war for freedom": "Whose? The Poles? The Lithuanians? The Hungarians? The Yugoslavs? They were all freer before the war for freedom. They are all, and many others besides, enslaved now."
20. Will the farmer benefit by the increased wages which labor will receive if we raise our tariffs? There is no question that he will, since labor will buy more of the products of the farm.
21. Since I have tried every conceivable way I can think of to solve this puzzle, and have gotten absolutely nowhere, I can only conclude that there is no solution for it.
22. We should not prepare for war, for from so wicked a thing as war there can come only doom immeasurable.
23. You say that the United States has the highest living standards of any nation in the world? I can disprove that statement by pointing to the sharecroppers in the South. Is that what you mean by a high living standard?
24. The Constitution of the United States embodies a truly good form of government, for its founders were unquestioned experts in political theory.
25. Commerce students should not be required to take courses in liberal arts such as literature and philosophy. Why not? Because such courses are not worth taking.
26. I would not hire X as a professor at this university. I believe that he is prejudiced against Jews, Catholics, and

Negroes.

27. I shall prove that the corrupt Demlican Party does not deserve your support and that the reliable Republocrat Party does.
28. If every person over sixty were given a pension of $200 per month, then they would buy more goods; this would increase the need for workers, whose wages would rise, and they in turn would raise their standard of living. Business would be kept at a high level, and everyone would benefit.
29. I pay no attention to writers who criticize communism for they are all prejudiced. The fact that they criticize communism is in itself proof that they are prejudiced.
30. Karl Marx and F. Engels, in the *Communist Manifesto:* "But don't wrangle with us so long as you apply, to our intended abolition of bourgeois property, the standard of your bourgeois notions of freedom, culture, law, etc. Your very ideas are but the outgrowth of your bourgeois production and bourgeois property, just as your jurisprudence is but the will of your class made into a law for all, a will whose essential character and direction are determined by the economic conditions of existence of your class."
31. Bishop Wilberforce scored a telling hit in his famous debate with Thomas Huxley on the subject of evolution. He simply inquired casually whether Huxley was descended from the monkeys on his mother's side or his father's side of the family (Clarke).
32. Salesman to undecided customer: "Shall I wrap it up, or do you wish to have it delivered?"
33. A pacifist argued that all wars are morally evil. When a friend asked if he meant that we should not fight even if an enemy attacked us, he answered, "But no one will attack us."
34. A railroad spokesman said, "The Union's spokesman accuses us of speaking the language of the railroads. We wouldn't dream of suggesting that he speaks the language of the unions."
35. Aristotle stated that "the good" meant that which the good man approves. *(Nichomachean Ethics.)*
36. How long, oh America, will you tolerate the misrule of the party in power? They have squandered public funds and denied the people the services they are entitled to; they have raised taxes and unbalanced the budget; they have inflated the currency and raised interest rates; they have allowed foreign goods to be sold in this country and they have antagonized our friends abroad; it's time for a change!
37. Nietzsche: "Those who disagree with me when I say that mankind is corrupt prove that they are already corrupted."
38. The ideas of "progress" and "individualism" are products of eighteenth century philosophers, and they reflect the special conditions of that age. So these ideas are out of date today and not valid for our society with its different social and economic conditions.
39. Psychological hedonism is the theory that every human action is always motivated by the individual's desire to benefit himself alone in what he does. If the opponent of this theory presents

the case of a marine who threw himself on a grenade, giving up his own life in order to save his buddies from certain death, the psychological hedonist is not impressed. He argues that it must have been done for selfish reasons, as proved by the very fact that it was done.

40. A well-known editorial writer wrote isolationist editorials for the *New York Daily News* and interventionist articles for *Collier's* in 1940. Would this information have been relevant to the truth of what he said in either publication?

41. The House of David sect in Benton Harbor, Michigan, was reported to believe that every member of the sect was immortal. When it was pointed out that the members showed the same mortality rates as other groups, the answer was that those who died were not true believers, since if they were they would not have died.

42. In 1911, in a radio debate, Frederick J. Libby argued that it was against the best interests of the United States to help England or otherwise meddle in the "European" war. Thomas Y. Elliot remarked that Mr. Libby's objections were without merit, since he was head of a "Christian Pacifist" organization, which was opposed to all wars, whether they were aggressive or defensive and for whatever reason they might be fought. Mr. Libby accused Mr. Elliot of the argumentum ad hominem. Was his objection justified?

43. "In what grave and important discussion," a Van Buren editor asked, "are the Whig journals engaged? How are they enlightening the public mind and supplying material for that deep and solemn reflection which befits a great people about to choose a ruler? We speak of the divorce of the bank and the state; and the Whigs reply with a dissertation on the merits of hard cider. We defend the policy of the administration; and the Whig answers, 'log cabin,' 'big canoes.' 'Go it, Tip, come it, Ty.' We urge the re-election of Van Buren because of his honesty, sagacity, statesmanship, and show the weakness and unfitness of his opponent; and the Whigs answer that Harrison is a poor man and lives in a log cabin. We show that he is not a poor man, that he does not drink hard cider except from choice, that his home is not a log cabin but a fine house;...the Whigs reply, 'No matter, the prairies are on fire.'" *(J. B. McMaster, A History of the People of the United States:* Vol. 6, p.565, D. Appleton-Century Company, 1906.)

44. "Treason can never prosper. What's the reason? That when it prospers none will call it treason."

CHAPTER 7

SYLLOGISMS, PROPOSITIONS, AND TERMS

Section I: Introduction to the Syllogism

In the previous chapter we noted the significance of the law of rationality, which requires that the evidence or reason should be sufficient to prove our beliefs or conclusions. We also noted the distinction between arguments containing conclusive proof and arguments in which evidence is merely sufficient to establish probabilities. The remainder of Part Two will be devoted to the principles of conclusive proof, or *validity.*

The argument is the fundamental unit of reasoning. We shall study various types of arguments, but our chief emphasis will be devoted to the *syllogism,* one of the basic forms of deductive reasoning. The syllogism will be defined, in a very broad sense, as an argument in which two premises lead to a conclusion. The importance of this form of reasoning has been recognized by logicians since the time of Aristotle (384-322 B.C.), though Aristotle, it may be noted here, treated it in a limited manner, and analyzed only one of its types. Much misunderstanding, however, is still prevalent concerning the nature of the syllogism. It has been called "artificial" and "outmoded." We shall endeavor to show that such criticisms rest on misunderstandings, and to justify, at least in part, the following statement by the American philosopher, W. P. Montague.

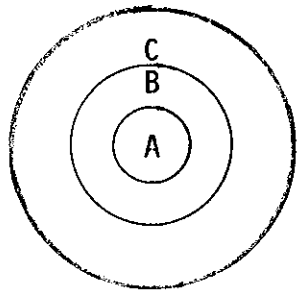
> Far from being artificial or outmoded, the Aritotelian sylogisms are the blood and flesh, or at least the connective tissue of all human discourse; and indifference to the logical laws which they exemplify is intellectual triviality, for it means indifference to the laws of any possible universe that the intellect can comprehend. *(The Ways of Things,* Prentice_Hall, 1940. p. 35.)

We shall begin our discussion of the syllogism with the simplest kings of examples, and develop the complexity of the subject by gradual stages. In order to facilitate our understanding of the logical form of such arguments we shall state them in the schematic form shown below. This form of presentation, which misleads many persons into thinking that syllogisms are "artificial," is adopted because it clearly indicates the structure of the argument. Thus:

All men are mortal.
Socrates is a man.
Therefore, Socrates is mortal.

The form of this syllogism is "artificial" in the sense that people do not argue in this schematic form. In ordinary discourse, as Montague has put it, the same argument might go like this: "Socrates, yes, even the divine Socrates, must be mortal, because we know that he is a man, and, alas we have to remember that whoever is man is also mortal." We shall deal with arguments in ordinary language in due course, but we will use the schematic form whenever we wish to clarify the logical structure of a syllogism.

Let us now consider the essential nature of syllogistic reasoning. Consider the following set of circles:



There are three circles, marked A, B, and C. B is inside C, and A is inside B. We shall now construct a syllogistic argument concerning these circles: If a circle B is inside a circle C, and A is inside circle B, then A must be inside C.

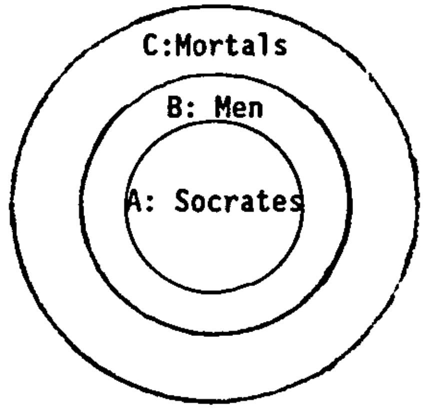
Stated schematically, we find:

B is inside C.
A is inside B.
Therefore, A is inside C.

If the premises of this syllogism are granted, then we must accept the conclusion. In this simple example we find the essential meaning of "validity": *An argument is valid when the premises necessitate the conclusion.* If it is impossible, granted the truth of the premises, that the conclusion should be false, then the argument is valid. If the reader grasps this simple example of valid reasoning, then he will be able to understand the more complicated examples, for all rest on principles of the same order.

In a valid argument, the truth of the premises guarantee the truth of the conclusion. Why is this so? We shall not attempt to answer this question, if indeed an answer is possible, but we will assume that we live in the kind of world in which such things are so and that the "light" of reason guides us correctly in such matters. If we know that a letter is inside an envelope and that the envelope is locked in a trunk, then it follows that the letter is inside the trunk. In any event, we shall assume that such reasoning is logically correct.

If we now return to the Socrates syllogism, we shall find that its validity rests upon the same principles. Its form or structure is exactly the same as the circles illustration. As logicians interested in validity, we are concerned with form or structure, rather than with content. The form is the framework or mold; the material or content is that which is poured into the mold. The use of symbols will help us to exhibit forms, and we shall therefore use symbols frequently. Let us then substitute the letters A for Socrates, B for men, and C for mortal. If we now draw circles for each of these letters, we will have exactly the same circles illustration we used above:



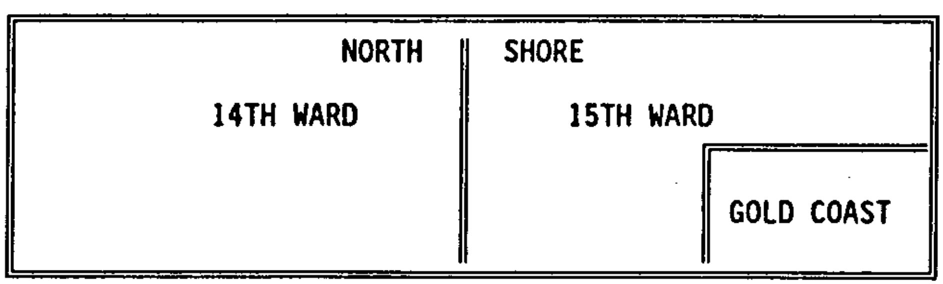
Note that the order of the *premises* of an argument is immaterial. We might have stated our argument as follows:

Socrates is a man.		A is inside B
All men are mortal.	or	B is inside C
Therefore, Socrates is mortal.		Therefore, A is inside C.

Diagrams enable us to "see" the structure of arguments with the eye of the senses as well as with the eye of the mind, and we shall resort frequently to diagrammatic illustrations. The use of these diagrams in logic is similar to their use in geometry. They are not indispensable, but they are very helpful aids in reasoning. We shall usually use circles, but other types of diagrams might also be used, such as maps. For example, examine the following syllogism:

The residents of the 15th ward are residents of the North Shore.
The residents of the Gold Coast are residents of the 15th ward.
Therefore, The residents of the Gold Coast are residents of the North Shore.

This syllogism might be illustrated by the following map:



This map shows that the syllogism is valid, just as the circles do. The circles, however, are easier to draw, and are generally preferred.

An introductory word concerning the relationship of "validity" to "truth" may be considered at this point. A valid argument is one in which the premises "necessitate" the conclusion. This means that if the premises are true, then the conclusion must be true, or, stated in a different way, that it is impossible for the premises to be true and for the conclusion to be false.

The actual truth or falsity of the premises is irrelevant. We ask: "If we *assume* that the premises are true, would the conclusion have to be true?" In Part Two we shall be concerned with structure, not with content; with the *form* of the argument rather than with the *truth* of what is stated. Thus (1) an invalid argument may be composed of true statements, and (2) a valid argument may be composed of false statements. Examples of each of these possibilities are as follows:

(1) All Muscovites are human beings.
All Russians are human beings.
Therefore, All Muscovites are Russians.

(2) All Holy Rollers are chain-smokers.
All Moslems are Holy Rollers.
Therefore, All Moslems are chain-smokers.

The first of these syllogisms is invalid, even though each statement is true. It is invalid because the premises do not logically justify the conclusion. (The reasons for its invalidity will be discussed later.) The second syllogism is valid, even though each of its constituent statements is false. Its form is exactly the same as our circles illustration, as you will find if you substitute A for Moslems, B for Holy Rollers, and C for chain-smokers. A valid argument is one in which the premises necessitate the conclusion. *If* these premises were true, then this conclusion would have to be true. A wholly satisfactory argument, of course, is one in which the premises are true, and the reasoning valid; but our only concern at present is with the meaning of validity.

Section II: The Categorical Proposition and Its Parts

In the last section we became acquainted with some simple examples of syllogistic reasoning. We saw how the validity of an argument could be exhibited through the use of circles or other types of diagrams. In the course of our study we shall find that not all syllogisms are so simple as those we have examined, and we shall also learn that syllogisms are not all of the same type. We have begun with examples of the "categorical syllogism," and shall deal with such syllogisms exclusively in the first few chapters of Part Two. We shall then go on to study hypothetical and alternative syllogisms. Syllogisms are classified on the basis of the types of propositions which enter into their construction. We shall, accordingly, study different types of propositions.* The same thought, moreover, may be expressed by different types of propositions. As examples of different types of propositions which

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*A proposition, as we learned earlier, ia a sentence which is either true or false. Not all sentences are true or false; for example, directive sentences or interrogative sentences. A proposition, in other words, states that something *is* or *is not* the case. We need not know whether a sentence is true or false in order to call it a proposition, as in "There is oil beneath this building." We do not know whether this statement is true or false, but it is surely one or the other.

may express the same thought, consider the following: (1) "Good readers are persons who find logic an easy subject," and (2) "If a person is a good reader then he finds logic an easy subject." The first of these is categorical, which means "unconditional"; the second is hypothetical, or "conditional." The first simply states a fact without conditions. The second, that something will be the case on the condition that something else will hold. But for the time being, we shall confine our attention to categorical propositions.

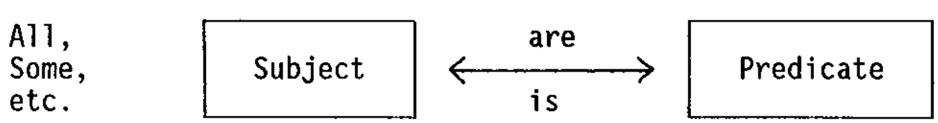
Our first task is to analyze categorical propositions which contain subjects and predicates. These terms are defined as follows:

Subject. The thing or entity of which we assert something.
Predicate. That which is asserted of the subject.

Examples: The desk is brown. "Desk" is the subject; that of which we make an assertion. "Brown" is that which we assert of the subject. Or: Dogs are animals. "Dogs" is the subject, and "animals" the predicate. When we speak of "subject" in logic, we always mean the *complete* subject. In "The desk which was bought five years ago and which was moved out of this room yesterday by two men wearing blue jeans is an antique" all the words preceding the verb "is" constitute the subject.

A categorical proposition (of the subject-predicate type) is made up of various elements: (1) The subject and predicate are called terms. Thus there are two terms: a *subject term,* and a *predicate term.* (2) There is the *copula* (a word meaning "that which joins"), which joins the subject term to the predicate term. The copula will always take a form of the verb "to be." ("Men *are* mortal." "This section *is* hard to understand." "I *am* a student of logic.") Note, however, that "is" and "are" are copulas only when they link the subject to the predicate. In "Students who are conscientious are bound to succeed" only the second "are" is the copula. The first is simply part of the subject term. And finally, (3) there are the "quantifiers," words such as "all," "some," "no," or "none," which indicate the extent to which we refer to the members of the subject term, as in "All men are mortal" or "Some women are fickle." When no quantifier is stated, "All" is generally understood. Individual subjects like "This desk" and "Socrates" have no qualifiers.

In graphic form, the proposition consists of the following elements:



Exercises

Identify the subject term, predicate term, copula, and quantifiers (if any):

1. Some movie stars are happily married.
2. All birds are members of a class of vertebrata called "aves."

3. Socrates is mortal.
4. Dogs are friendly animals.
5. Birds which are in the hand are things equivalent to two in the bush.
6. The ships which sailed last night are sloops which are very fast.

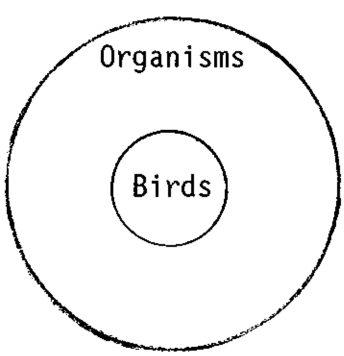
Section III: The Class-Analysis of Subject-Predicate Propositions

We shall interpret all subject-predicate propositions as asserting that two classes have certain relations to each other. This means that we shall think of the subject term as referring to a class of individuals or things, and similarly with the predicate. Let us carefully define the meaning of "class." A class means a group of things, or a collection of things having some characteristic in common. This characteristic may be a "natural" one, as in the group of things called "mammals." The common characteristic may also result from an arbitrary act of selection, as in "The people you saw on the street today." These people constitute a group having in common the fact that they were seen by you today. The class may consist of individuals who do not take more than two lumps of sugar in their coffee. Thus there are no limitations on grouping any entities into a class. We may even find a common characteristic between "a very heavy elephant" and "the thought of the square root of minus one in an angel's mind." They belong to the class of things which were used as illustrations in this paragraph.

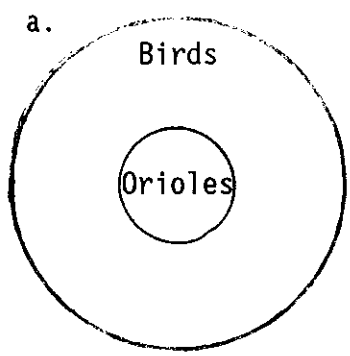
Every entity may be said to belong to an infinite number of classes. Thus "tiger" belongs to the following classes and to an infinite number of others: existing things, physical things, living things, things found in jungles, in zoos, things which inspired the poems of William Blake, and so on.

A class, then, is any collection of things having some common characteristic. The members of a class need not be actually existing things. We may speak of "sprinters who can run one hundred yards in less than nine seconds" or "human beings who are without sin," though neither class has any members. A class having no members is called a "null" class.

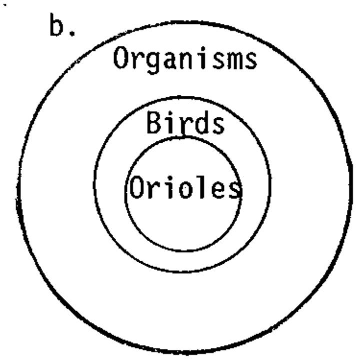
The importance of thinking of subjects and predicates as classes of things will soon become evident when we begin to test the validity of syllogisms by the use of diagrams. When we think of "Orioles are birds" as representing two classes of things, the manner in which the circles should be drawn is immediately apparent. Similarly with "Birds are living organisms." These propositions may be diagrammed separately or they be combined, as in the following:



a.

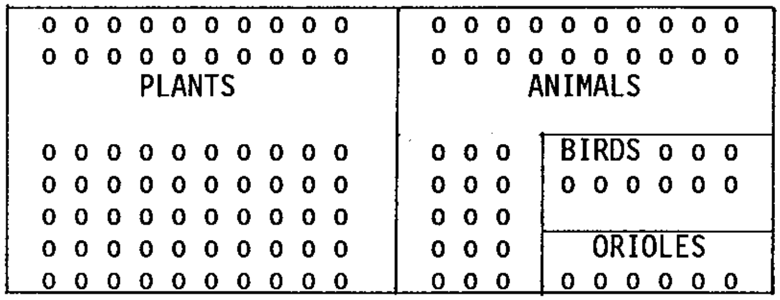


b.



These relationships may also be exhibited by a "map" that emphasizes the fact that the classes are always collections of individuals. In the following "map" diagram each small circle stands for an individual member of the class to which it belongs:

LIVING ORGANISMS



An important qualification of the above remarks must now be noted. Some sentences have single individuals as their subjects, as in "Ferdinand is a non-belligerent bull" or "This book is a logic text." In such cases the subject term is stated to be a *member* of the predicate class, and is not *included* within it. In other words, *class-inclusion* refers to the relationships of two classes to each other; *class-membership* to the relationship when the subject term is an individual. But though we shall have occasion to note situations in which this distinction is an important one, we shall nevertheless usually treat an individual subject in the same way as we treat a class. We shall use a circle to diagram the individual subject. We shall treat the individual, for most purposes, as a class having only one member and *include* it within another class.

The form in which many sentences are stated may not clearly indicate that the subject and predicate terms refer to classes of things. When we encounter such sentences we must translate them into the proper form so that the relations of two circles to each other will be clearly indicated. A fuller discussion of this subject must be reserved for a later chapter, but we shall now note a very simple form of completion which some sentences require. Thus, "The desk is brown" is an incomplete sentence for class-analysis, since "brown" is not the name for a collection of individual things. A class is made up of individual things, each of which could be pointed to, and it would be impossible to point to a "brown." When either subject or predicate is stated as an *adjective*, we must always add the "completing complement," or noun, in order to refer to a collection of individual things. Completed, the above sentence would read, "The desk is a brown thing." The sentence "All men are mortal" requires the addition of "beings," or we could simply add an "s" to "mortal," for "mortals" is a noun that refers to a class.

We shall now introduce the symbol $<$, using it to mean "class-inclusion" (or class membership). When this symbol stands between two classes, for example, $A < B$, we shall interpret it as meaning "A is (are) included in the class of B." The symbol is actually a substitute for the copula and it emphasizes the relationship of the inclusion of one class in another. The grammatical copula *are* represents the more traditional type of usage; the symbol of inclusion "<," the more modern usage. We shall use both. Frequently, however, we shall find that the symbol expresses our meaning more accurately, especially when the subject is an individual. Thus, "Franco is a dictator" really means "Franco < dictators," i.e., "Franco is in the class of dictators." The symbol emphasizes the fact that the predicate class is a plural noun. Note carefully the exact words for which the symbol < stands: It means *"are included in the class of" or "is a member of the class of."*

Exercises

Restate the following sentences, substituting the symbol of class-inclusion (<) for the copula, and supply the missing quantifier and the completing complement where necessary. The predicate should be stated in the plural form in all cases. Read each proposition orally, using the words for which < stands.

For example: Suppose the sentence is, "Judges are trustworthy." We supply the missing quantifier "all" and add the completing complement "persons." The sentence now reads: "All judges are trustworthy persons." Using the symbol of class-inclusion we get: All judges < trustworthy persons. This is read as "All judges are included in the class of trustworthy persons."

1. Some movie stars are happily married.
2. Americans are peace-loving.
3. All philosophers are reflective.
4. Ferdinand is gentle.
5. Liberals are idealistic.
6. Liberals are idealists.
7. Her eyes are blue.
8. This book is a logic text.

Section IV: Affirmative and Negative Propositions

Propositions are classified according to their quantity and quality. The difference between "all" and "some" or between "none are" and "some are not" is a difference in quantity; the difference between affirmative and negative is one of "quality."

The propositions we have thus far examined have all been affirmative in quality. Each sentence asserted that a certain predicate may be affirmed of a subject. All have been of the form "S is P," using "S" for the subject of a categorical proposition and "P" for its predicate. But a categorical proposition may also assert that a certain predicate *cannot* be affirmed of a subject, i.e., that the predicate is *excluded* in whole or in part from the subject class. The presence of words like "no" or "not" usually indicate that a proposition is negative, as in "No S is P," or "Some S's are not P's," or "S is not P." Examples of such negative propositions in words are: "No men are angels," "Some men are not egoists," Jayne Glamour is not an actress."

Note carefully the following sentences: "Nurses are non-combatants," "Nurses are not combatants." These sentences have the same meaning, but the first is stated affirmatively; the second, negatively. The difference between them centers in the copula. Does the copula indicate that the subject is something-or-other, or that it *is not?* There are many adjectives and nouns which are prefixed by "non," but the use of such terms does not make the propositions negative. The question is whether the negation belongs to the copula. "S is P" and "S is non-P" are both affirmative, but "S is not P" is negative. Note carefully that the form "No men are angels," (No S is P) asserts that angelic qualities cannot be affirmed of men. It means "Men *are not* angels," or "S *is not* P"; hence it is negative.

The symbol "<," we noted above, stands for class inclusion. It is an affirmative symbol. The corresponding negative symbol is "≮" which stands for class-exclusion. When we say "S is not P" we mean that the class S is excluded from the class P (in whole or part, depending upon the quantifier). "≮" stands for the words "are excluded from the class of." This symbol will be explained in greater detail in Section VI.

Exercises

Distinguish the copulas as affirmative or negative.

1. He is unwise.
2. He is not unwise.
3. No S is P.
4. No metals are non-conductors.
5. Some women are not intuitive.
6. Some nonfanatics are enthusiasts.
7. S is not non-P.
8. All non-S are non-P.
9. No non-fools are persons who do such things.
10. Teetotalers are persons who do not drink hard liquor.

Section V: Universal and Particular Propositions

In the last section we distinguished between affirmative and negative categorical propositions. We shall now classify propositions as "universal" or "particular." This distinction is based upon the extent to which we make reference to the members of the class of things named by the *subject* term. When we refer to *all* of the members of the subject class, as in "All nations are preparing for war," the proposition is universal. When reference is made only to *some* of the members of the subject class, as in "Some nations are preparing for war," the proposition is called particular. The distinction between universal and particular propositions is one of "quantity." When the quantifier is "all" the sentence is universal; when it is "some" the sentence is particular.

Similarly with negative propositions. The sentence "No men are angels" is universal, for it refers to all men, rather than merely to some. The quantifier "no" indicates a universal proposition. "Some students are not athletes" with the quantifier "some" is obviously particular. The term "particular," by the way, comes from an older usage in which it meant "referring to a *part* only," i.e., part of a class, not all of it.

Propositions which have an individual person or thing as subject are also classified as universal. Thus, "H.G. Wells was a second-rate novelist" or "This pen has a ballpoint" or "Carlyle was not a great man" are universals, though their subjects consist of single persons or things. The justification for this usage is that when the subject is an individual we refer to all of the subject, not to part of it.

There are thus two types of universal propositions, those which use the quantifier "all" and those which have an individual as subject. The former are called "general" and the latter "singular." But both are universals.

It is easy to distinguish any universal proposition from a particular proposition if we remember that a particular proposition always uses the quantifier "some" or other word (such as "many," "few") indicating that only part of the subject class is being referred to.

When the subject class has no quantifier, as in "Women are fickle," we may be uncertain as to whether the writer is referring to all women or only to some. As previously indicated, we shall adopt the convention of interpreting such indefinite statements as referring to all, unless the context makes it clear that "some" is intended. When the context does not indicate which quantifier is intended, assume that the proposition is universal.

To sum up, there are two types of universal propositions, general and singular. A universal-general proposition refers to *all* of the members of the subject class; a universal-singular has as its subject a *single* individual person or thing. A particular proposition is one which speaks of *some* of the members of the subject class. In tabular form:

Universal:
General - *All* men are mortal. *No* men are angels.
(Look for the quantifiers "all" or "no.")
Singular- *This* table is brown. *John* is not a dancer.
(A single thing or individual is the subject.)
Particular:
The quantifier is *Some*, or any word which designates less than the whole of a class.

Exercises

Classify the following propositions as universal-general, universal-singular or particular:

1. All fish live in water.
2. Some dogs are homeless.
3. No textbooks are thrillers.
4. That theory is discredited.
5. You are wrong.
6. Lazy students are failures.
7. T.S. Eliot is a British subject.

8. Those apples look edible.
9. Some apples are not tangy.
10. That group of men should be watched.
11. Human beings are never satisfied.

Section VI: The Four Types of Categorical Propositions

We have classified propositions in terms of quantity and quality: as universal or particular, and as affirmative or negative. Combining the four elements in the two classifications, we derive four different combinations, which we shall label as A, E, I, and O in accordance with the custom of logicians:

Universal-Affirmative	A form
Universal-Negative	E form
Particular-Affirmative	I form
Particular-Negative	O form

Henceforth, we shall use the letters A, E, I, and O to signify the combinations for which they stand. These letters were originally used by mediaeval logicians, who derived them from the first two vowels in the two Latin words, *affirmo* (I affirm) and *nego* (I deny). Thus the affirmative forms are A and I; the negative forms are E and O. We shall now study these forms in detail and we shall diagram them in four different combinations of circles, a method of diagramming invented by the Swiss mathematician and physicist Euler (1707-1783).

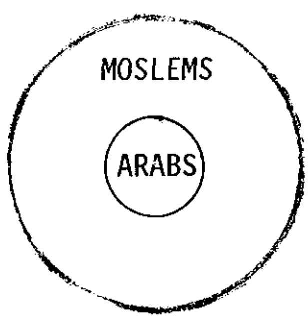
1. The A-form

Examples: "All Arabs are Moslems" and "Ali-Baba is a Moslem."

The A-form (universal-affirmative) has the two types shown in the examples, the general and the singular. Using the symbols "S" for subject and "P" for predicate, "All S is P" represents the general form and "S is a P" represents the singular. We are already acquainted with the universal and affirmative nature of these types.

In class terminology, we write "All S < P" or "S (an individual) < P."

The same type of circle diagram will be used for both:



2. The E-form

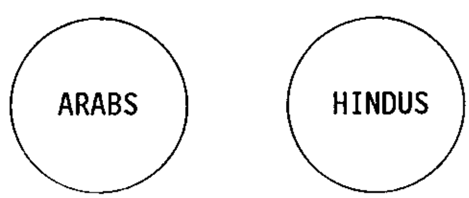
Examples: "No Arabs are Hindus" and "Ali-Baba is not a Hindu."

The E-form (universal-negative) also has two types, general and singular. With respect to the *general* type, we recall that a universal proposition refers to *all* of the subject. The assertion that "No Arabs are Hindus" refers to *all* Arabs, for it states that each and every one of them is excluded from the class of Hindus. Similarly in "No logic texts are easy to read," we assert that all logic texts are outside the class of books which are easy to read. The E-form is thus universal, for it refers to *all* of the subject-class.

The E-form is negative for it denies that a certain predicate can be affirmed of the subject. It asserts that the subject does not belong to the predicate class; the relation of inclusion is denied *in toto*. This is the same as to say that the subject class is *completely excluded* from the predicate class.

The *singular* E-form, "Ali-Baba is not a Hindu," should be analyzed in the same manner. Here we say that the predicate cannot be affirmed of an individual, or that this individual is *excluded* from the predicate class. Individual subjects, as we saw earlier, are treated as universals.

In circles, we use the same form for the general and singular universal-negative. "No S is P," and "S (an individual) is not a P," are exhibited by two circles which have no point of contact, viz.:

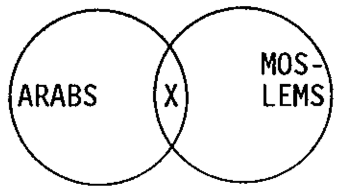


The symbol of class-exclusion, as we have noted, is "$\nless$," standing for the words "are excluded from the class of." The E-form in class terminology will take the following forms: "All Arabs $\nless$ Hindus," "Ali-Baba $\nless$ Hindus." These are read, "All Arabs are excluded from the class of Hindus," etc. Note carefully the sharp difference between the traditional statement of the E-form and its class statement: "*No* S is P" and "*All S* $\nless$ P." "No S is P" means that *all* of S is completely excluded from (outside of) the class of P.

3. The I-form

Example: "Some Arabs are Moslems."

The I-form (particular-affirmative) asserts that part of the subject class is included within the predicate class. "Some S is P." In diagrammatic form, we find that the S and P circles intersect:



The area marked X indicates that there are individuals who are members of both classes.

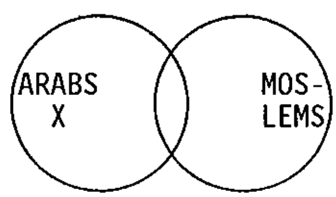
In class symbolism: Some S < P.

4. The O-form

Example: "Some Arabs are not Moslems."

The O-form (particular-negative) asserts that some of the members of the subject class are excluded from, or are "outside of," the predicate class. This form is particular, since the quantifier is "some," and negative since it asserts that part of the subject *is not* in the predicate class. In the traditional manner we say, "Some S is not P." In class symbolism we use the symbol of exclusion once more and write, "Some S $\nless$ P," which should be read, "Some S is excluded from the class of P."

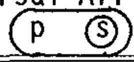
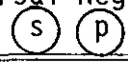
In circles:



Note the position of the "X" in this diagram. It is in the subject circle outside of the predicate circle, and indicates that there are members of the subject class who are outside the predicate class. In the I-form, the position of the X indicated that there were some entities which were members of both classes.

The four types of categorical propositions reveal all of the possibilities in the relations of one class to another. There are four possibilities, covered by the forms we have designated under the letter, A, E, I, and O. One class is wholly or partially included within another, or it is wholly or partially excluded from another. These forms alone can be diagrammed in circles; a proposition which can be diagrammed in circles must be in one of these four forms. Some further refinements in the relations of these circles will be discussed in the next chapter.

The four forms may be presented schematically, as in the following table:

TYPES OF PROPOSITIONS		TRADITIONAL FORM	CLASS-TERMINOLOGY
A Universal-Affirmative 	General Singular	All S is P X (an individual) is P	All $S < P$ $X < P$
E Universal-Negative 	General Singular	No S is P X (an individual) is not P	All $S \nless P$ $X \nless P$
I Particular-Affirmative 		Some S is P	Some $S < P$
O Particular-Negative 		Some S is not P	Some $S \nless P$

The reader should carefully note the two forms of expression in which each type of proposition may be stated. The "traditional" form of expression states each type in ordinary language, and the "class-terminology" form expresses the same type in the symbols of class inclusion and exclusion. These different forms of expression are exactly equivalent to each other, and the reader should familiarize himself with these equivalences. Note in particular the two different ways in which the E-form is expressed.

Exercises

Classify the following propositions as, A, E, I, and O, and define each in terms of quantity and quality, (universal-affirmative, universal-negative, particular-affirmative and particular-negative).

1. No saints are sinners.
2. All politicians are interested in votes.
3. Some statesmen are politicians.
4. Some politicians are not statesmen.
5. Lewis is not a timid man.
6. Shakespeare is a great poet.
7. Some explanations are non-luminous.
8. Some types of non-compliance are worthy of chastisement.
9. All saints are excluded from the class of sinners.
10. Some citizens are excluded from the class of voters.
11. Those exercises are quite difficult.

Section VII: The Distribution of Terms

A new technical term, "distribution," must now be added to our logical vocabulary, and we will have completed our analysis of categorical propositions. This term is used in a precise and technical sense by logicians, and its customary meaning should be ignored. The understanding of this term is of great importance, since distribution is the fundamental idea in the analysis of the syllogism.

We shall speak of the "distribution" of terms. To say that a term is distributed means that we have referred to *all* of the members of the class designated by that term. Thus, when we say "All dogs are animals," the term "dogs" is distributed because we have referred to *all*. We have referred to each and every member of the class "dogs." In "Some books are texts" we have referred to only part of the class of "books," and the term "books" is undistributed.

We shall now examine the manner in which the A-E-I-O forms distribute their terms. Since it is quite easy to understand the notion of distribution when applied to the *subjects* of propositions, we shall dispose of this aspect of the problem very briefly, and then give a more extended discussion to the distribution of the predicate terms in each of the four forms.

The two universal propositions distribute their subject terms. The A-form (All dogs are mammals) distributes its subject "dogs" and the E-form (No crows are green birds) distributes its subject "crows." "No crows" refers to *all* crows, i.e., all crows are excluded from the predicate class.

The two particular propositions I (Some Americans are liberals) and O (Some Arabs are not Moslems) obviously refer to *some* Americans and *some* Moslems rather than to all, and so these subject terms are undistributed.

We turn now to the distribution of the *predicate terms* in each of the four forms.

1. The A-form: "All dogs are mammals."

This proposition does not say anything about *all* mammals. "Dogs" constitute only part of the class of mammals, so this sentence refers only to *some* mammals. "Mammals" is an undistributed term in this sentence. We may now generalize our analysis of this proposition: The predicate term is undistributed in every A-form proposition. Similarily we may generalize each of the analyses of the other forms.

In the typical A-form proposition, as in the one above, the predicate class is larger than the subject class. But the two classes may be co-extensive, as in "All triangles are 3-sided figures." In this case we know (from our knowledge of mathematics) that the subject class and the predicate class have the same members. But *as such*, an A-form proposition of the form "All S is P" tells us that its subject is distributed but it does *not* tell us that the predicate is. We shall therefore follow the rule that an A-form leaves its predicate undistributed. If we follow this rule we will never go beyond the information actually given to us.

We shall use the symbols "d" and "u" for distributed and undistributed. We may thus write our A-form as follows: All dogs (d) are mammals (u). Using S and P once more, and using the symbol of class inclusion, we have $S(d)<P(u)$. Note that the quantifier "all" is unnecessary in this symbolic form, since "d" means "all." Note also that the singular A-forms are treated in the same manner as the general.

2. The E-form: "No crows are green birds."

The predicate term "green birds" is distributed here. The proposition states that "All crows are excluded from the class of green birds." This obviously means that *all green birds* are outside the class of crows, so an E-form distributes both its subject and predicate. We are given information concerning each and every member of both classes.

Using the symbols of distribution, our proposition may be written as "No crows (d) are green birds (d)." The student should become adept at translating all E-forms into class terminology, viz.: "All crows (d) are excluded from the class of green birds (d)," or "All crows (d) $\nless$ green birds (d)." In completely symbolic form, this would read: $S(d) \nless P(d)$. The singular E-form is treated in the same manner.

3. The I-form: "Some Americans are liberals."

The predicate term is undistributed. We are informed that the two classes, Americans and liberals, overlap, i.e., that some Americans are liberals and, conversely, that some liberals are Americans. We have received no information concerning *all* liberals. We have not been told that *all* liberals are Americans, but only that some are. Thus the predicate "liberals" is undistributed. In class-symbols: $S(u) < P(u)$.

4. The O-form: "Some Arabs are not Moslems."

The predicate of an O-form is distributed. The proposition asserts that all Moslems are completely outside the group designated by the subject term. This will become clear if we remember that many of the Arabs of Lebanon are Christians. These Arabs are "some" Arabs, and none of them are Moslems, so all Moslems are completely "outside of" these Arabs of Lebanon.

Another example may be helpful. If I say that "Some students are not Republicans," I refer to the entire class of Republicans. Look through the entire class of Republicans, I am saying, and you will not find any of these particular students. They are outside of the entire class. Any negative proposition, in other words, in saying "not" *excludes* its subject term from the entire class designated by the predicate term, and its predicate is distributed. The O-form in symbols: $S(u) \nless P(d)$.

Our discussion of the distribution of terms in the A-E-I-O forms may be summedup in the following table:

			Subject	Predicate	Traditional Form	Class Terminology
Universals	Aff.	**A**	d	u	All Sd is Pu	$Sd < Pu$
	Neg.	**E**	d	d	No Sd is Pd	$Sd \nless Pd$
Particulars	Aff.	**I**	u	u	Some Su is Pu	$Su < Pu$
	Neg.	**O**	u	d	Some Su is not Pd	$Su \nless Pd$

As an aid to memory, two simple summary principles will be helpful:

(1) Affirmative propositions (A and I) never distribute the predicate term.
(2) Negative propositions (E and O) always distribute the predicate term.

The distribution of the subject term is indicated by the quantifier and should be quite easy to figure out.

Exercises

Classify the following propositions (a) as affirmative-negative. (b) as universal-particular, (c) as general-singular (where relevant), (d) as A, E, I, or O, and (c) indicate the distribution of the subjects and predicates of each:

1. All composers are geniuses.
2. Johann Sebastian Bach is a genius.
3. No composers are geniuses.
4. Philip Emanuel Bach is not a genius.
5. Some composers are geniuses.
6. Some composers are not geniuses.

PARSING THE PROPOSITIONS*
(Consider the above exercises)

1. As to quantity: ____________________
2. As to general or singular: ____________________
3. As to quality: ____________________
4. As to type: ____________________
5. As to distribution: Subject ____________________
   Predicate ____________________
6. Rule: ____________________
   ____
   ____
   ____

Affirmative propositions leave the predicate term undistributed.

Negative propositions always distribute the predicate term.

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*This section on "Parsing The Prepositions" from here to the end of Chapter 7 has been added by the WVBS Instructor (Mac Deaver).

CHAPTER 8

The Analysis of Categorical Syllogisms

Section I: The Definition of the Syllogism

A syllogism, in the broad sense of the word, is an argument made up of two premises and a conclusion. There are, as we noted in the previous chapter, different types of syllogisms, but we are at present concerned only with the categorical type, sometimes called the "Aristotelian" syllogism, since it was the only type recognized by Aristotle. A categorical syllogism is an argument made up of three categorical propositions, which contain, between them three and only three terms.

Later on, we shall study non-categorical types of syllogisms. The fundamental distinction between the categorical and the non-categorical types lies in the types of the propositions of which the syllogism is composed. Categorical syllogisms are composed of categorical propositions, which are made up of terms. Such propositions are called "simple," as distinguished from propositions whose constituent elements are sub-propositions. The latter are called "compound." The following is an example of one type of compound proposition: "If all men are rational beings, then all men are entitled to justice." This proposition has two sub-propositions as its constituent elements: "All men are rational beings" and "All men are entitled to justice." Non-categorical syllogisms are based upon compound propositions. But we shall come to these later. For the time being we shall be concerned exclusively with categorical propositions and categorical syllogisms.

A categorical syllogism may be more precisely defined as an argument composed of two categorical premises and a categorical conclusion, containing three and only three terms, in which the three terms are combined in such a way that a term in one premise will be the same as the term in another premise, and the other two terms will be the same as the terms which appear in the conclusion. The reader need not bother to memorize this definition, since its meaning will become quite clear in a moment. The definition indicates that a relation between two classes of things is established by virtue of their relation to a third class. For example, let us suppose that we are concerned with the question as to whether hay fever is in the class of infectious diseases. The solution of this problem requires that we relate these two classes to a third class. We must seek for a third term which will connect the two terms with which we begin. We may connect them by the class of "allergy diseases." Since we know that "all allergy diseases are non-infectious" and that "hay fever is an allergy disease," we draw the conclusion that "hay fever is not infectious." This is an example of a categorical syllogism.

In this chapter we shall be concerned with the analysis of categorical syllogisms, with the primary aim of learning the rules of validity in such arguments. We shall also learn how to check the rules of validity by drawing diagrams. For clarity in presentation we shall begin by stating all syllogisms in a schematic or "artificial" form and deal with syllogisms as they appear in living discourse in a later chapter. The difficulties encountered in analyzing complicated syllogisms, as we shall see, are chiefly problems of language and not of form.

Section II: Basic Words in the Analysis of Categorical Syllogisms

The categorical syllogism is an argument containing two premises and a conclusion.

	All actors are egoists.	*Premises*
	All movie stars are actors.	
Therefore,	All movie stars are egoists.	*Conclusion*

There are three propositions, each with a subject and predicate term. There are three different terms in the syllogism, each of which is used twice. The three terms (or classes of things) in our example are "actors," "egoists," and "movie stars." Each term is used twice, making three pairs of terms. Henceforth, when we speak of a "term" we must remember that it is used twice.

The terms are called "middle term," "major term," and "minor term." These words are defined as follows:

Middle term: The term which appears *in both premises*. Since each term is used twice, and twice only, the middle term does not appear in the conclusion. "Actors" is the middle term.

Major term: The *predicate* of the *conclusion* is called the "major" term. "Egoists," the predicate of the conclusion, is the major term. The major term also appears in the first premise, "All actors are egoists."

Minor term: The *subject* of the *conclusion* is called the "minor" term: "Movie stars." It also appears in the premise, "All movie stars are actors."

In analyzing syllogisms we shall use symbols for our three terms. The choice of symbols is an arbitrary matter. Traditionally, logicians have used M for the middle term, S for the minor term, and P for the major term, and we shall adopt this practice for the most part. Since S stands for the subject of the *conclusion* (minor term), and P for the predicate of the conclusion (major term) we must mark the minor and major terms in the conclusion before we can mark them in the premises.

Using these symbols, we use "S" for "movie stars," "P" for egoists, and "M" for "actors." Symbolized, our syllogism reads as follows:

	All M are P.
	All S are M.
Therefore,	All S are P.

Another convenient way of symbolizing is to use the first letter of each term. This would give us A for actors, M for movie stars, and E for egoists, and we would have:

All A are E.
All M are A.
Therefore, All M are E.

The *major premise* is the premise which contains the *major term* (and the middle term), and the *minor premise* is the premise which contains the *minor term* (and the middle term). We must examine the conclusion of the syllogism to determine the minor and major terms: these are by definition, the subject and predicate terms of the conclusion.

Exercises

Identify the middle term, major term, and minor term in the syllogisms below. Note that each type of term appears twice. Also identify the premises as major or minor.

1. All men are mortal.
   Socrates is a man.
   ∴ Socrates is mortal.
2. All politicians are opportunists.
   No statesmen are opportunists.
   ∴ No politicians are statesmen.
3. All A are B.
   No C are B.
   ∴ No C are A.
4. Some K are M.
   No N are M.
   ∴ Some K are not N.

Section III: Preliminary Analysis of Categorical Syllogisms

The analysis of a syllogism requires the application of certain techniques. We shall illustrate these techniques by applying them to the syllogism in Section I. (Since we have not yet examined the rules of validity, our analysis at this stage must be of a preliminary nature.)

Step 1. Write out the syllogism, symbolizing the terms with the letters S, P, and M, viz.:

All <u>actors</u> are <u>egoists</u>.
M P

All <u>movie stars</u> are <u>actors</u>.
S M

∴ All <u>movie stars</u> are <u>egoists</u>.
S P

Step 2.

Identify each proposition as an A, E, I, or O form. We find that each of these propositions is in A-form. We then place the symbols for "distributed"

(d) and "undistributed" (u) to the right of the symbols M, S, and P in each proposition. The chart on page 36 can be used as a guide for reference as to the distribution of subjects and predicates in the four forms. Our syllogism will now look like this:

A-form		All <u>actors</u> are <u>egoists</u>.
		M d P u
A-form		All <u>movie stars</u> are <u>actors</u>.
		S d M u
A-form	∴	All <u>movie stars</u> are <u>egoists</u>.
		S d P u

Step 3, As a final step at this stage, "gather" the symbols, stating them in the class analysis form:

$$\begin{aligned} & Md < Pu \\ & Sd < Mu \\ \therefore\ & Sd < Pu \end{aligned}$$

Note that the quantifiers need not be stated when we use the symbols, since the signs of distribution indicate whether the propositions are A-E-I-O forms.

We are now ready to study the rules which determine whether a syllogism is valid or invalid.

Section IV: The Rules of the Categorical Syllogism

There are five rules which determine the validity of a categorical syllogism. A syllogism which complies with each of these rules, i.e., which violates none of them, is valid. A syllogism which violates any one of these rules is invalid.

The rules of the syllogism resemble the axioms of mathematics in that they are assumptions or principles which are not proved but accepted as true. But though we shall not attempt to prove the rules, diagrams and other forms of illustrations may help us to "see" that these rules must hold. As we noted earlier, if all of B is in C, and A is in B, then A must be in C. The principle involved in this reasoning may be generalized: If one class is wholly included within another, then any part of the first class is part of the second. Why is this so? Some thinkers hold that this is simply a characteristic of the language which we speak, others that logical relations are grounded in the nature of things, so that we simply "see" that these principles characterize the world in which we live. The latter view would appear to be nearer the truth. In any case, however, we must recognize that not all logical principles can be proved, since every proof requires the use of principles which are themselves not proved.

The five rules or axioms of the syllogism may be divided into two groups, as follows:

A. Rules concerning the proper distribution of terms (rules of quantity):

Rule 1. The middle term must be distributed at least once.

Rule 2. A term which is undistributed in a premise must also be undistributed in the conclusion.*

B. Rules concerning negative propositions (rules of quality).

Rule 3. No conclusion is necessitated by two negative premises.

Rule 4. If either premise is negative, then the conclusion must be negative.

Rule 5. A negative conclusion cannot be drawn from two affirmative premises.

We shall now study these rules in detail. But before we analyze a syllogistic argument in terms of the rules, we should inspect it in order to determine whether it meets the definition of a categorical syllogism. It must have three and only three terms, each of which is used twice, with a middle term appearing in each of the premises.

Rule 1. The middle term must be distributed at least once. Consider the following argument:

All brain surgeons are highly trained men.
All jet pilots are highly trained men.
Therefore, All jet pilots are brain surgeons.

This foolish argument illustrates the following principle: the fact that two classes of things have one or more characteristics in common does not justify us in concluding that the two classes are identical, or even that one is included within the other. Brain surgeons and jet pilots share the characteristic of being highly trained men, but we can draw no conclusions about their relationships to each other from this information.

As logicians, however, we must exhibit the fallacy in terms of the technical rules of the syllogism. We begin by setting up the syllogism in accordance with our method of analysis:

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*Note that this rule does not require that a term which is distributed in a premise must also be distributed in the conclusion. It means only that if a term is undistributed in a premise it must not be distributed in the conclusion. In other words, we must never go from "u" in a premise to "d" in the conclusion.

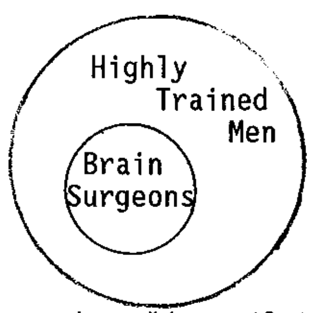
A-form		All brain surgeons are highly trained men.	
		P d	M u
A-form		All jet pilots are highly trained men.	
		S d	M u
A-form	∴	All jet pilots are brain surgeons.	
		S d	P u

Rule 1 tells us that the middle term must be distributed at least once. We note that the middle term is "highly trained men" symbolized by "M." We note that "M" is undistributed ("u") in both premises. Rule 1 has been violated. This argument contains the fallacy of "the undistributed middle term."

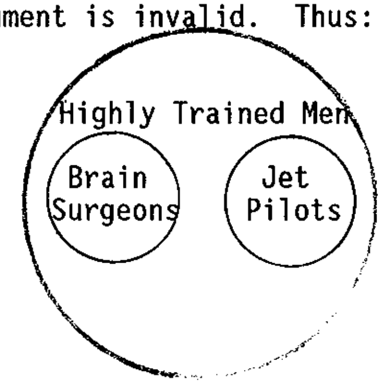
Let us pause for a moment to examine the rationale of Rule 1. But first, let us be clear as to what "validity" means. A valid argument is one in which the conclusion necessarily follows from the premises. This means that if we grant the truth of the premises we *must* grant the truth of the conclusion. An invalid argument is one in which the conclusion is not thus necessitated.

The meaning of validity in this connection will become clearer if we illustrate by the circle diagrams. We ask the question: Is it possible to draw the circles in such a way that the premises will be shown to be true, without showing that the conclusion must be true? If we can do this then we have shown that the premises do not necessitate the conclusion.

The major premise tells us that "all brain surgeons are highly trained men." In circles:



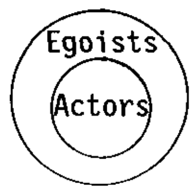
The minor premise tells us that "jet pilots are highly trained men." Now, this question: Can you put a circle for "jet pilots" inside the "highly trained men" circle without showing that jet pilots are brain surgeons? If you can, then you have shown that the conclusion drawn by the syllogism is not necessitated, and the argument is invalid. Thus:



Note that it is of no importance that you are able to draw a diagram showing that the conclusion *might* be true. The only question is: Is it possible to draw a diagram in which the conclusion is *not* true? This is the only thing we need to show in order to demonstrate that the syllogism is invalid.*

"All actors are egoists":

In a valid argument, on the other hand, it is impossible to draw circles which show the premises to be true without at the same time showing the conclusion to be true. Let us illustrate with the "actors" argument, a valid syllogism. We begin our diagramming by drawing circles for the major premise,



The minor premise tells us that "all movie stars are actors." Now the question: Can you draw the minor premise as required without showing that "All movie stars are egoists"? A glance will tell you that this is

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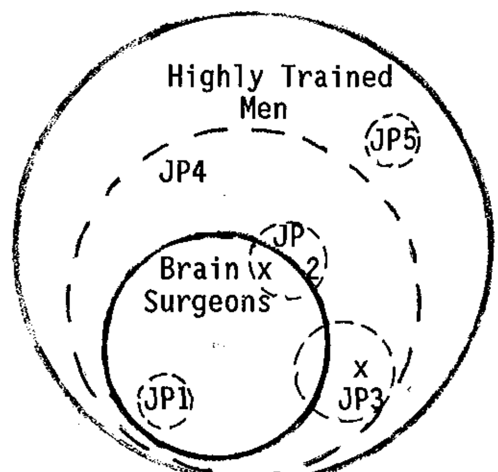
*The premises require us to draw jet pilots *wholly within* the class of *highly trained men.* Thus there are five different ways in which the minor premise may be drawn in conjunction with the major premise:



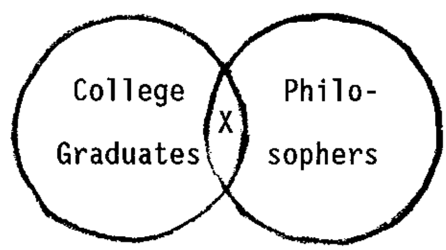
JP 1 shows jet pilots as wholly included within brain surgeons, JP 2 shows them as partially within, and JP 3 as partially outside: JP 4 shows *brain surgeons* as wholly within the class of jet pilots, and JP 5 shows jet pilots as wholly outside the class of brain surgeons. The conclusion asserted that JP 1 was necessitated by the premises: the diagram shows that this location of jet pilots is not necessitated. It is sufficient for our purposes to exhibit *one* possibility *other than* the conclusion asserted by the argument. In our illustration we drew "jet pilots" at JP 5 to show the invalidity of the argument.

impossible, so the argument is valid.

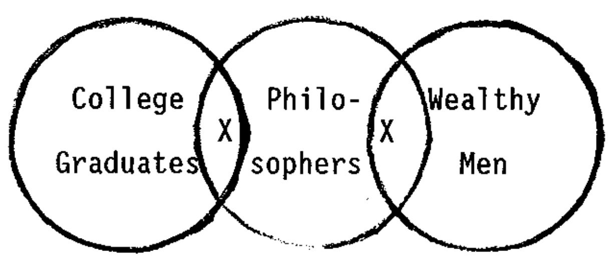
Here is another type of syllogism that involves the fallacy of the undistributed middle term: "Some college graduates are philosophers, and some philosophers are wealthy men; hence, some college graduates must be wealthy men." We set up this syllogism as follows:

I-form	Some college graduates are philosophers.
	S u M u
I-form	Some philosophers are wealthy men.
	M u P u
I-form	Some college graduates are wealthy men.
	S u P u

The middle term "philosophers" (M) is not distributed at least once. The diagram will exhibit the invalidity of this argument if we can draw circles which exhibit the truth of the premises without showing the truth of the conclusion. We proceed as follows: "Some college graduates are philosophers" gives us:



Now, can we draw a circle for "Some philosophers are wealthy men" without showing the conclusion drawn by the argument? We can:



It is very important to note that the fact that the conclusion happens to be true is irrelevant with respect to the validity of a syllogism. The only question is: Do the premises *necessitate* the conclusion? From the premises given to us in this argument it does not necessarily follow that "some college graduates are wealthy men," so the argument is invalid.

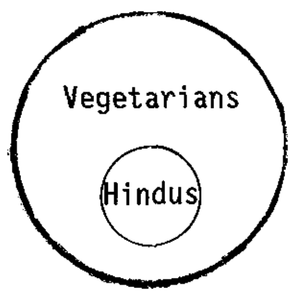
Rule 2. A term which is undistributed in a premise must also be undistributed in the conclusion.

The following syllogism contains a violation of this rule:

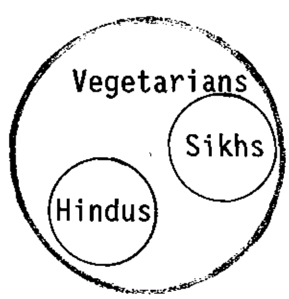
A-form	All <u>Hindus</u> are <u>vegetarians</u>.
	M d P u
E-form	No <u>Sikhs</u> are <u>Hindus</u>.
	S d M d
E-form	No <u>Sikhs</u> are <u>vegetarians</u>.
	S d P d

Note that "vegetarians" is undistributed (u) in the premise and dis trib-uted in the conclusion. The rule states that a term which is undistributed in a premise must not be distributed in the conclusion. The violation of this rule is called "illicit distribution" or "illicit process." We may also refer to the term involved in the fallacy and speak of "illicit major" (as in the syllogism above) or of "illicit minor" when the fallacy involves the minor term. The point of the rule is that when a term is un-distributed in the premise this gives us information concerning *some*, or part, of the class des-ignated by the term. If we distribute this term in the conclusion, we say something about *all* of this class, and this is to "out-talk" our information. It is not fallacious, on the other hand, to go from "d" in the premise to "u" in the conclusion, for if the premise gives us information about "all" we can then draw conclusions about "some."

Let us now diagram the argument. We draw the major premise:



We now ask our key question: Can we draw a circle for the minor premise, i.e., showing the Sikhs class outside the Hindus class, without showing that "no Sikhs are vegetarians," the conclusion drawn by the syllogism? We can, viz.:



Rule 3. No conclusion is necessitated by two negative premises.

Here are two negative premises:

No marines are cowards.
No cowards are aviators.

The rule tells us that no possible conclusion can be necessitated by two negative premises. Why not? Well, consider the possible conclusions we might draw: (1) All marines are aviators, (2) No marines are aviators, (3) Some marines are aviators, and (4) Some marines are not aviators. (We could also reverse these subjects and predicates.)

We begin by diagramming "No marines are cowards":

We must now draw "no cowards are aviators." The "aviators" circle must beoutside the "cowards" circle, but no directions other than this are given. Aviators might be inside the marines circle wholly or partially, or outside wholly or partially. Which ever conclusion we draw (1-4) cannot be necessitated since there will be three other possibilities.

Rule 4. If either premise is negative, then the conclusion must be negative.

Rule 5. A negative conclusion cannot be drawn from two affirmative premises.

The last two rules are of lesser importance, since violations are rarely encountered, but they are necessary in order to complete the "system" of the rules of validity. An argument may violate none of the first three rules and yet violate one of these, so we must check by all five rules in order to guarantee validity.

Violation of Rule 4:
All communists are Marxists.
Some Brazilians are not Marxists.
∴ Some Brazilians are communists.

Violation of Rule 5:
All men are rational animals.
All rational animals are moral agents.
∴ Some moral agents are not men.

The student will have little difficulty in showing that the conclusion in Rule 4 is not necessitated. The fact that some Brazilians exist outside the Marxist circle does not prove that they exist within the communist circle.

Drawing a proper diagram for Rule 5 presents difficulties which will be discussed in Section VI.

We may now note that the last three rules concerning negative propositions may be summed up in one formula: If *negative* propositions are used in a syllogism, then one and only one premise must be negative and the conclusion must be negative. Rule 3 emphasizes "one and only one negative premise"; Rule 4 that the conclusion must be negative when a premise is negative; and Rule 5 that a premise must be negative when the conclusion is negative. But the separate rules clarify each aspect and show the three ways in which the formula may be violated.

Exercises

Analyze the ten syllogisms on pages 48-49 in accordance with the methods used in this chapter. Check for violations of the rules: if none of the five rules are violated then the syllogism is valid. Draw the circle diagrams to "illustrate" your answers in the first five syllogisms. Remember that in order to illustrate invalidity the diagrams need exhibit only one situation in which the premises are true and the conclusion false.

To illustrate the way in which these syllogisms should be analyzed, the first one is worked out for you:

Step 1. Copy the syllogism on your note-paper, adding the following notations:

(a) Symbolize middle, minor, and major terms by M, S, and P, using each symbol twice.
(b) Identify each of the three propositions (two premises and conclusion) as A, E, I, and O forms.
(c) Place the signs for distributed (d) or undistributed (u) to the right of the symbols M, S, and P. (The distribution signs follow automatically after you have identified the A-E-I-O forms.)

Syllogism No. 1 will now look like this:

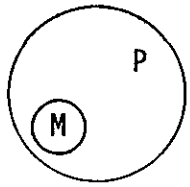
A-form		All Republicans are free-enterprisers.
		M d P u
E-form		No Democrats are Republicans.
		S d M d
E-form	$\therefore$	No Democrats are free-enterprisers.
		S d P d

For convenience in analysis we shall now "gather" the symbols of our syllogism, as follows:

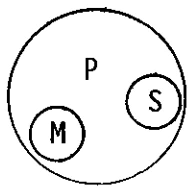
$M\ d < P\ u$
$S\ d \nless M\ d$
$S\ d \nless P\ d$

Step 2. We check now for violations for the rules. Rule 1 tells us that the middle term must be distributed at least once. We note that M is distributed twice. No violation here. We then check for a possible violation of Rule 2, that a term undistributed in a premise must also be undistributed in the conclusion. We find that P was "u" in the major premise and "d" in the conclusion. Violation of Rule 2. The syllogism is invalid. It is unnecessary to check the remaining rules if you find that one rule has been violated.

Step 3. Draw a diagram to show that the premises of this argument may be true and the conclusion false. We shall designate the terms by the symbols instead of words. Begin by drawing the major premise:



Now, can we draw "No S is M" without showing that "No S is P"? Yes, as follows:



The drawing illustrates the invalidity of the syllogism.
Syllogisms for analysis.

1. All Republicans are free-enterprisers.
   No Democrats are Republicans.
   ∴ No Democrats are free-enterprisers.

2. All bankers are golfers.
   All middle-aged men are golfers.
   ∴ All bankers are middle-aged men.

3. Some Hindus are vegetarians.
   All Brahmins are Hindus.
   ∴ Some Brahmins are vegetarians.

4. All Republicans are free-enterprisers.
   No Socialists are free-enterprisers.
   ∴ No Socialists are Republicans.

5. All ministers of the gospel are shepherds of men.
   Some teachers of philosophy are not ministers of the gospel.
   ∴ Some teachers of philosophy are not shepherds of men.

6. Some believers in democracy are advocates of a planned society.
   Some advocates of civil rights are not advocates of a planned society.
   ∴ Some believers in democracy are advocates of civil rights.

7. No Democrats are Republicans.
Some Republicans are not isolationists.
∴ Some Democrats are not isolationists.

8. Some Russians are not communists.
All communists are fanatics.
∴ Some fanatics are not Russians.

9. All Republicans are protectionists.
All conservatives are Republicans.
∴ Some protectionists are not conservatives.

10. All beginning students in logic are students whose knowledge of the rules is superficial.
No beginning students in logic are persons without rational capacity.
∴ Some students whose knowledge of the rules is superficial are not persons without rational capacity.

Section V: The Diagramming of Syllogisms

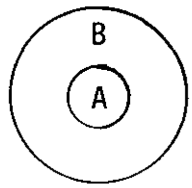
The diagramming of syllogisms in circles is an art which requires a thorough understanding of its principles, and, in some cases, a more refined analysis of the logical forms than we have as yet presented. This section will be devoted to this problem.

Let us restate our aims in diagramming arguments. We have learned the rules to which a valid syllogism must conform. We have learned the meaning of validity, viz.: a valid argument is one in which it is impossible for the conclusion to be false when the premises are true. We have also learned that if it is possible to draw the circles in such a way that the conclusion might be false though the premises are true, then the argument is invalid. And on further point before we proceed: Though the diagrams are not essential for proving validity, since the rules are sufficient for this purpose, the diagrams give us visible or "geographical" pictures of the relations of the members of classes to each other, so that we can see just why the argument is valid or invalid.

The chief difficulty in diagramming is that some ingenuity is often required to find a diagram which conforms to the premises and yet reveals that the conclusion need not follow. And worse, the Euler circles, while accurate as far as they go, do not adequately cover the full meaning of the A-E-I-O forms and do not furnish us with a sufficiently good instrument for diagramming all possible syllogisms. We shall therefore now present a supplementary interpretation of the diagrams for the A-E-I-O forms and we shall then have an adequate tool for all syllogisms which use these forms.

1. The A-form

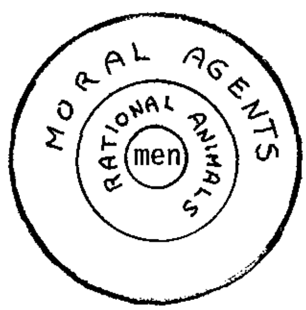
"All A is B" is diagrammed by Euler as:



This diagram indicates that all of A is included within B, but it also shows some of B is outside of A. Now, this is normally the case in A-forms, as in "all dogs (A) are animals (B)." "Dogs" is the smaller class, and there are animals other than dogs. But this is not necessarily true in all A-forms. In "all triangles (A) are three sided figures (B)," A and B are *coextensive*, and there is no B outside of A.

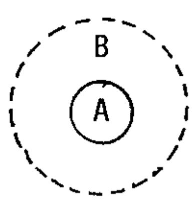
In other words, the Euler diagram for A is correct insofar as it shows that A is *at least* as large as, or coextensive with B (never smaller), but it is misleading in that it indicates that B is always larger than A. Since the A-form does not necessarily imply the latter and since the Euler diagrams may indicate validity if the second possibility is ignored, these circles are inadequate to handle all the possibilities in arguments containing A-forms.

To illustrate: The syllogism illustrating the violation of Rule 5 on page 47 (Men are rational animals and rational animals are moral agents, so some moral agents are not men) is invalid, but its invalidity cannot be shown by the ordinary Euler diagrams. It would be quite pointless to diagram this argument as shown below:



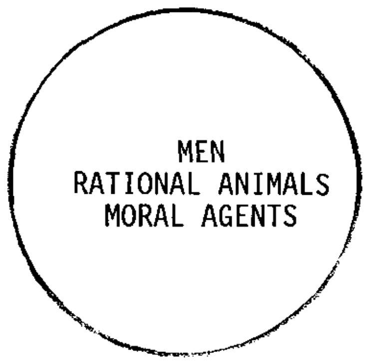
The point of diagramming an invalid argument is to show graphically that the premises may be true and the conclusion false, but this diagram indicates that the conclusion is true. It appears from these circles that some moral agents are outside the class of men. This indicates that we need an improved method of diagramming to exhibit the invalidity of this argument.

We shall now draw an A-form as follows:



The B-circle is shown by a broken line to indicate that B may or may not be larger than A. Thus an A-form has two possibilities: (1) in which B is a larger class than A, and (2) in which B is coextensive with A. These possibilities are shown below. (The dot between A and B stands for "both"):

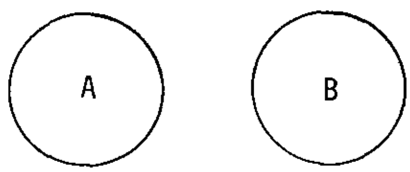
Let us now rediagram the last syllogism considering the possibility that the A-form may be represented by possibility 2. If the subjects and predicates are coextensive, the diagram will look like this:



The class of men, in other words, may be coextensive with the class of rational animals (it actually is!), and the class of rational animals may be coextensive with that of moral agents'. Our drawing now shows that the premises of this syllogism may be true but that the conclusion that "some moral agents are not men" does not necessarily follow from the premises.

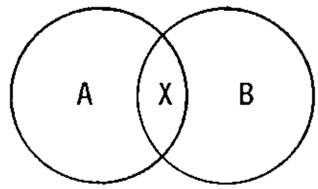
In a valid argument the conclusion will be necessitated whichever interpretation we give to the A-form diagrams.

2. The E-form
"No A is B" is diagrammed by Euler as:



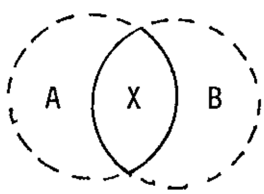
These circles are fully adequate for all possibilities arising under this form.

3. The I-form
"Some A is B," diagrammed by Euler as:



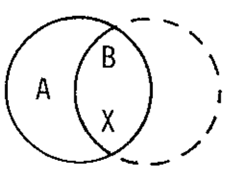
suggests that there may be some A that is outside of B (and some B outside of A). But these conclusions do not necessarily follow from "Some A are B" if we give it what logicians call a "strict interpretation." The nature of "strict interpretation" may be made clear by an example: A careful thinker who likes to travel visits the Melanesian Islands, and he observes natives eating betel. All the natives he has observed eat betel, but he cannot say that all Melanesians do (though they possibly may), nor can he say that some do not, and so he reports that "some Melanesians eat betel." A logician, reading this statement will interpret it as follows: He says some do; he has not said that some do not; so he means that *at least* some do and *possibly all* eat betel. This is the strict interpretation of an I-form: At least some A are B and possibly all A are B.

In ordinary speech "some A are B" usually means "not all are," but this is not the strict interpretation used in logic. In other words, from "some A are B" we cannot conclude "some A are not B." "Some A is B" should be repreented by the following diagram:

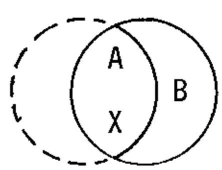


The solid lines indicate what we definitely know, or are sure of, namely, that at least some A are B. But the following possibilities may also hold in fact:

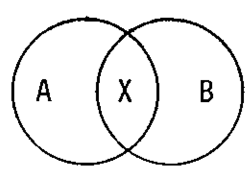
1.



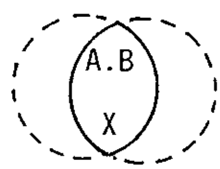
2.



3.



4.



Note that the original solid lines and the "x" are present under each interpretation. Diagram 1 means that all B are A*; Diagram 2 that all A are B; the third that some A are B, but also that some A is outside of B and some B out-

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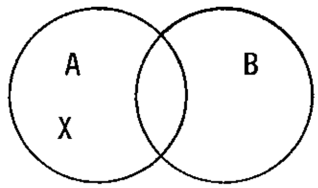
*"Some A is B" is convertible with "Some B is A." The latter leaves open the possibility that all B is A.

side of A; and the fourth that A and B are identical classes. (The broken lines may be eliminated from each interpretation.)

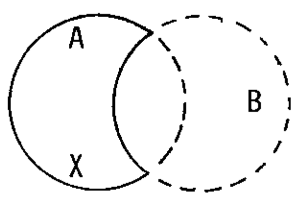
4. The O-form

"Some A is not B" is diagrammed by Euler as:



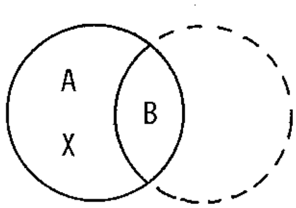
This suggests that some A may also be inside B. "Some A is not B" does not imply that some A is B to the careful thinker. Let us illustrate with our globetrotter once again. He is now among the Eskimos. He has heard tales about the blubber diet of Eskimos and he makes inquiries. Those interviewed tell him that they do not eat blubber. He now reports that "some Eskimos do not eat blubber." In ordinary language this would suggest that some of them do, but not to a logician. Strictly interpreted the statement means "At least some Eskimos do not eat blubber, and possibly none do." It is also possible that some do, but a valid argument must satisfy *all* of these interpretations of "Some do not," not merely one.

We shall represent the O-form by the following diagram:

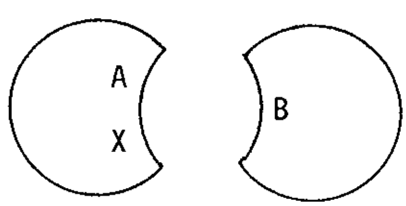


The solid lines indicate what we are sure of, marked by the "x." This new diagram may refer to the following factual situations:

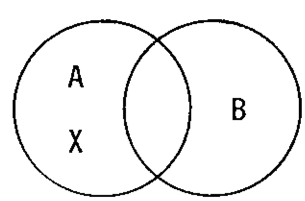
1.



2.

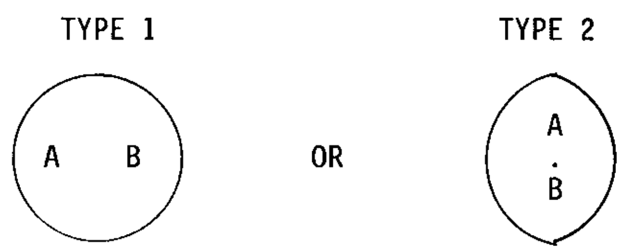


3.



Here again the original solid portion marked "x" is present under each interpretation, i.e., each shows that "some A is not B." But the first interpretation indicates that some A is not B and that all B is A. This would be the case in "Some animals (A) are not dogs (B)" for all dogs are animals. The second diagram is equivalent to the ordinary E diagram. It indicates that, strictly interpreted, "Some A is not B" does *not* mean that "Some A is B." The third interpretation indicates that some A is not B, that some A is B and that some B is not A. An illustration of the last situation is found in "Some men are not poets"; for some men *are* poets, and some poets are not men.

When the A-E-I-O forms are interpreted with the new diagrams, the broken lines may be discarded for each interpretation. Note also that where the diagram requires it, the two possibilities in the meaning of "All A is B" may be represented by either

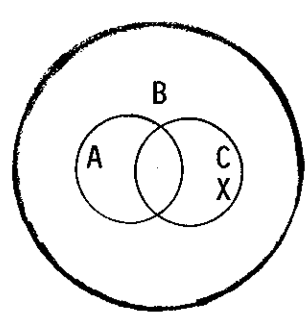


When we diagram arguments, we should use the simpler Euler circles where these are adequate. The special diagrams should be resorted to only when necessary. Remember that we need find only one interpretation under which the premises are true and the conclusion might be false, to prove an argument invalid. Try the possible interpretations until you can find an appropriate diagram (when you know from the rules that the argument is invalid.)

We shall now present another illustration of the use and value of the new method. Assume that we have the following syllogism:

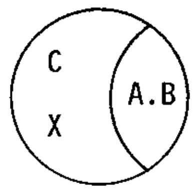
Some C is not A.
All A are B.
∴ Some B are not C.

This syllogism commits the fallacy of illicit major term. If we draw a diagram for one of these premises and try to fill in with the other in order to show that the premises may be true and the conclusion false, we will find that the ordinary Euler circles will not do the job. The following diagram, for example, is obviously not helpful:



This diagram does *not* exhibit the invalidity of the syllogism, since it does not show that the premises might be true and the conclusion false. Rather, it appears to indicate that the conclusion is true, for some of the B circle is outside the C circle. We need a diagram which will show that these premises do not necessarily result in the conclusion presented.

The invalidity of this argument can be shown very clearly by the use of our new method of diagramming. We shall use Type 1 under the O-form above to diagram the major premise. This will show that Some C is not A and also that All A is C. If we now interpret the minor premise All A are B as involving the possibility that A and B are identical classes, we have the following:



The new diagram reveals graphically that if some C is outside of A and all A is B, does not necessarily follow that some B is outside of C. (Everything in the circle is part of C.) The same results would follow if the A class were smaller than the B class.

Exercises

Draw circle diagrams for syllogisms 6-10 on pages 49,50. Use the ordinary Euler diagrams or the revised diagrams, whichever will suit your purposes. The problem in each case, to repeat, is to find a diagram that will indicate, by a geographical picture, that the premises of an argument may be true and the conclusion false. Make your diagrams as simple as possible.

Section VI: The Corollaries, Figures, and Moods

In this section we shall briefly discuss two matters of theoretical interest pertaining to the theory of the syllogism: the corollaries of the rules, and the figures and moods of the syllogism. These matters are of interest in showing how the principles of the syllogism may be organized into a deductive system.

1. The corollaries.

The five rules of validity are sufficient for the testing of the validity of all syllogisms. No other rules are necessary. These rules play a role in the theory of the syllogism somewhat comparable to that of the axioms in Euclidean geometry. The axioms of geometry are undemonstrated or "primitive" propositions which are used to prove theorems. In a similar manner we may use the five rules to demonstrate derived rules or corollaries (theorems) and we may then use such derived rules in the testing of syllogisms. But the corollaries are not indispensable, since they contain no new principles. Our discussion of the manner in which they are derived, however, will furnish an interesting logical exercise in working out the implications of a deductive system.

Corollary 1. No valid conclusion may be drawn from two simple particular premises.

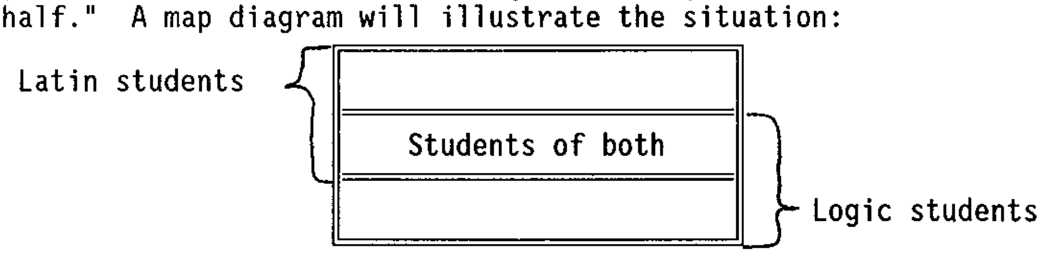
This corollary states that no conclusion can be validly derived from the combinations of two I-forms, two O-forms, or an I and an O. We already know that two O-forms are an impossible combination,since no conclusion follows when both premises are negative (Rule 3). Let us consider the other two possibilities.

Suppose that both premises are in the I-form. Then no terms will be distributed. The middle term will then be undistributed, and Rule 1 will be violated. Let us now suppose that we have an I and an O in the premises. Only one term will now be distributed (the predicate of the O). The distributed term must be the middle term to satisfy Rule 1. But the conclusion of the syllogism must be negative (Rule 4). If the conclusion is negative, then its predicate must be distributed. But both the major and minor terms were undistributed, so the major term cannot be distributed without violating Rule 2. We have thus proved that the corollary must hold on the basis of the rules.

There is, however, an important exception to the corollary we have just proved. Note that we proved the rule for "simple" particular propositions. This qualification must be explained. A particular proposition refers to *some* of the subject, i.e., less than all. But there are many different ways in which we may refer to less than all of the members of a class. We may say "a few," "one-half," or "most" S's are P's. All of these are interpreted as meaning "some," i.e., less than all. But a particular proposition beginning with "most," which means "more than one-half," is a "special" as distinguished from a "simple" type of particular, for which Corollary 1 will not hold. For consider an argument such as the following:

Most of the students in this college are students of Latin.
Most of the students in this college are students of logic.
Therefore, Some of the students of Latin are students of logic.

If more than half of the students study Latin and more than half study logic, then some students must study both subjects since "most" means "more than half." A map diagram will illustrate the situation:



This syllogism is valid despite the fact that it appears to violate Rule 1 and Corollary 1. It is a special type of case, whose validity is based upon mathematical relations. The corollary will therefore hold for all combinations of particular premises except when both have the quantifier "most."

Corollary 2. If one premise is particular, then the conclusion must be particular.

If one premise is particular, then the other must be universal (Corollary 1). Both premises cannot be negative (Rule 3). This leaves the following possible combinations of premises: AI, IA; AO, OA; EI, IE. We must prove that each of these six combinations cannot yield a valid conclusion which is universal.

Let us consider AI, or IA. Can the conclusion be a universal? It cannot be E, for a negative conclusion would violate Rule 5. Nor can it be an A. For AI or IA contains only one distributed term, which must be the middle term (Rule 1). If the conclusion were an A, the minor term would be distributed, violating Rule 2.

Combinations AO and OA. The conclusion cannot be an A (Rule 4). Nor can it be an E, for the premises contain two distributed terms, one of which must be the middle term (Rule 1). An E-form distributes both subject and predicate, and at least one of these terms must have been undistributed in the premises. The same reasoning applies to the combinations EI or IE.

So much for illustrations of the manner in which corollaries are demonstrated. The reader may try his hand at proving the following: Corollary 3: The premises must contain at least one more distributed term than the conclusion, and Corollary 4: No conclusion can be validly inferred from a particular major premise and a negative minor.

2. The figures and moods of the syllogism

Syllogisms may be classified with respect to the position of the middle term in the premises and with respect to the quantity and quality of the premises and the conclusion. The position of the middle term determines the *figure*, the *mood* is determined by the quantity and quality of the propositions. There are four possible figures, since the middle term may take four possible positions, viz.:

Figure 1	*Figure 2*	*Figure 3*	*Figure 4*
M.....P	P.....M	M.....P	P.....M
S.....M	S.....M	M.....S	M.....S
S.....P	S.....P	S.....P	S.....P

The moods are determined by the various combinations of A-E-I-O forms. When both of the premises and the conclusion are A-forms, the mood is called "AAA." The first letter stands for the major premise, the second for the minor, and the third for the conclusion. If the major premise is an A, the minor and E, and the conclusion an E, the mood is AEE.

Let us now compute the number of different syllogistic forms which are possible, taking account of the different combinations of moods and figures. Since there are four types of propositions and three propositions in a syllogism, there are four times four times four or sixty-four possible combinations of moods. These combinations may be arranged in four types of figures, so that we have four times sixty-four or 256 possible syllogistic forms. Most of these forms are invalid. We can easily eliminate the invalid forms by applying the rules and corollaries to each possible combination of premises. Thus, both premises cannot be negative (Rule 3). This eliminates all syllogisms whose premises are in the moods EE, EO, OE, and OO. Both cannot be particular (Corollary 1), and IE is ruled out by Corollary 4. This leaves us with only eight possible combinations of premises which can yield valid conclusions in some or all of the figures: AA, AE, AI, AO, EA, EI, IA, and OA.

The next problem is to determine which combinations of premises are valid in each of the figures. For example, premises AA and AI cannot be valid in Figure 2, for the middle term is the predicate in each premise in that figure, and if the premises are affirmative, the middle term will be undistributed. We shall now state some special corollaries which determine the rules of validity for each figure, but we shall not prove these corollaries. Their proof will follow the general procedure we used in proving the general corollaries concerning validity.

Figure 1:

Corollary 1. The minor premise must be affirmative.
Corollary 2. The major premise must be universal.

Figure 2:

Corollary 1. The premises must differ in quality.
Corollary 2. The major premise must be universal.

Figure 3:

Corollary 1. The minor premise must be affirmative.
Corollary 2. The conclusion must be particular.

Figure 4:

Corollary 1. If the major premise is affirmative, the minor must be universal.
Corollary 2. If either premise is negative, then the major must be universal.
Corollary 3. If the minor is affirmative, the conclusion must be particular.

The mediaeval logicians worked out a set of mnemonic lines to aid the student in memorizing the valid moods of each figure, viz.:

Barbara, Celarent, Darii, Ferioque prioris;
Cesare, Camestres, Festino, Baroko secundae;
Darapti, Disamis, Datisi, Felapton, Bokardo, Ferison habet;
Quarta insuper addit...

Bramantip, Camenes, Dimaris, Fesapo, Fresison.

The names in all these lines were invented, the instructions being in Latin. The first line gives us the valid moods in the first figure; the second, the valid moods in the second figure; and so on. The italicized letters in each name indicate the mood. Thus a syllogism in Barbara is one having A-forms in premises and conclusion. The interested reader may wish to determine which moods are valid in each figure, with these suggestions as his guide. These classifications are of course unnecessary if our sole interest lies in the testing of syllogisms for validity, the five rules being sufficient for that purpose. The systematic organization of the rules and corollaries, however, has great theoretical interest, as indicating the nature of a deductive system, the subject of the concluding section of this chapter.

Section VII: A Note on Deductive Systems

We are now familiar with the meaning of deduction. Granted certain premises we can deduce conclusions which necessarily follow from these premises. A *deductive system* refers to a collection or body of propositions which are so organized that some serve as the premises and the others as conclusions which necessarily follow from the premises. An example of such a deductive system is found in Euclidean geometry, a model for all such systems since 300 B.C. Euclid's premises, or "assumptions," include the following elements: (1) Undefined terms, such as "length" and "breadth," (2) definitions, such as the definition of a "line" as a "breadthless length," (3) axioms, or "common notions," [e.g., "Things equal to the same thing are equal to each other." "The whole is greater than any of its parts."] (4) postulates,* such as "All right angles are equal," and (5) rules of procedure, such as "It is possible to draw a straight line from any point to any other point."

From these assumptions Euclid deduces theorems, which follow from the assumptions as the conclusion follows from the premises of a valid argument. A famous example is the Pythagorean theorem: "The square formed on the hypotenuse of a right triangle is equal to the sum of the squares formed on the other two sides."

The relation of the rules of the syllogism to the corollaries resembles that of the assumptions to the theorems in the Euclidean system, the rules serving as assumptions (axioms or postulates) and the corollaries as theorems. This collection of propositions is thus a simple example of a deductive

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*Euclid's postulates differ from his axioms in that the latter are "common notions" which are "generally accepted" outside of geometry, whereas the postulates are introduced by geometry itself. Strictly, the axioms are assumptions which are taken from outside the field of a given science, postulates are those which are introduced by the given science; but we shall treat both as assumptions of the deductive system.

system.*

Some further comments on the nature of a deductive system may be helpful. (1) The postulates of an ideal deductive system should possess three characteristics: independence, consistency, and sufficiency. "Independence" means that the postulates should not be reducible to each other, for, if they are, then the reducible postulates would be theorems. "Consistency" refers to the fact that the postulates should not result in inconsistent theorems, and "sufficiency" means that they must be adequate to yield all the known truths concerning the set of propositions to which they are applied, i.e., all of the propositions in this set must be deducible from the postulates. (2) The postulates of a given system are not proved within that system. If they could be proved then they would be theorems rather than postulates. Whether they can be proved in some other fashion is simply irrelevant in the given system, the sole interest lying in the deducibility of the theorems from the assumptions. Thus, though Euclid's axioms and postulates seem "self-evident," this is not proof that they are true. It follows that *any* set of postulates may serve as the basis of a deductive system, but in practice the important systems are those in which the axioms are in "agreement" with the real world in some sense. A valuable system, moreover, is one which will yield significant theorems. (3) Finally, we should not think of the axioms as being first in the order of *discovery*. They are first, or fundamental, only in a logical sense and are discovered *after* there already exists a collection of propositions forming the body of a science. The formal scientist, such as Euclid or Aristotle, then seeks for a small number of assumptions from which the known truths concerning the subject matter may be deduced as theorems.

As we proceed in our introduction to logic we shall discuss other types of syllogisms. These, as we shall see, may be translated into the "Aristotelian" forms we studied in this chapter. But we shall also encounter other formal truths concerning deduction which cannot be reduced to the syllogistic form. This suggests that the entire field of logic cannot be organized into a completely systematic formal science, and indeed this was the prevailing view during the two thousand or more years following Aristotle's work. Beginning in the nineteenth century, however, with the work of George Boole and other logicians, in particular the great work of Whitehead and Russell in their *Principia Mathematica* (1910-1913), an important advance occurred in logical theory. Modern "symbolic" or "mathematical" logic has sought to demonstrate that all of the principles of logic may be proved on the basis of a small number of assumptions in an abstract deductive system. The exposition of this aspect of the new logic, however, belongs to a more advanced work than the present one.

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*For a more thorough discussion of these matters the interested reader should see M. R. Cohen and E. Nagel, *An Introduction to Logic and Scientific Method*, Harcourt, Brace and Company, 1934, Chapters 4 and 7; and J. N. Keynes, *Formal Logic*, 4th ed., The Macmillan Company, 1906, pp. 287 ff.

CHAPTER 9

SEMANTICS AND THE SYLLOGISM

Section I: The Need for Semantical Analysis

We have studied the rules of the syllogism and have learned how to distinguish a valid from an invalid argument. But though we now know the rules, our ability to analyze syllogisms is still very limited. This is true for two reasons: (1) Our analyses have been limited to examples presented in the schematic or artificial form suitable for the clearest possible exhibition of the structure of the argument analyzed, and (2) our analyses have been confirmed to arguments in which the propositions clearly indicated the relationships of the three terms to each other. It is easy to apply the rules when syllogisms are presented in such ready-made form, but in living discourse syllogisms are not presented in schematic form, nor are the terms always easily identifiable. In order to remedy these limitations and to acquire the ability to analyze arguments as they occur in everyday discourse, we shall investigate a number of semantical problems. We shall learn how to translate everyday language into its correct logical form, and we shall also study the principles of "equivalences" in propositions. Propositions stated in different forms may express the same meanings, and transformations from one form into another may be required for syllogistic analysis.

The need for further analysis of meanings will become apparent when we examine the following syllogism:

All healthy people are non-alcoholics.
No unhealthy people are strong.
∴ No strong people are alcoholics.

This syllogism appears to contain five terms ("unhealthy people," "strong people," "healthy people," "non-alcoholics," and "alcoholics"), and thus it appears to violate the requirement that syllogism must have three and only three terms. But, as we shall presently learn, the first premise may be translated into "all alcoholics are unhealthy people," since this proposition has identically the same meaning as the first premise. We now have only three terms, and a valid syllogism.

Section II: Sentences in Irregular Forms

A categorical proposition must be stated in one of the A-E-I-O forms. Such forms indicate the manner in which two classes are related to each other in inclusion or exclusion. In everyday discourse, however, propositions may not clearly indicate the relations of two classes to each other, and in such cases we must translate the sentences into the correct form.

The necessity for this translation may be clarified by a somewhat far-fetched analogy. The rules of the syllogism give us a kind of logical machine for testing arguments. This logical machine may be compared with a stamping machine that impresses stampings on pieces of metal. The pieces are inserted into the machine, a lever is pressed, and out comes the stamped piece. But the machine will not accept any piece of metal. The metal must be of the proper size and shape for insertion into the machine. Now, our logical "machine" is one into which we insert arguments. After the argument is "inserted," we press the lever (the rules), and out comes the argument stamped "valid" or "invalid." But the logical machine also requires that the pieces (the propositions) must be in the proper form for insertion, and "proper form" here means that the class relationships must be clearly indicated. Thus every proposition must be stated in strict A-E-I-O form, with all of the constituent elements, such as the quantifier, the copulas, the signs of inclusion or exclusion, and the names of the two classes, in their proper places. The chart below demonstrates for us the framework for each A-E-I-O form, with blank spaces which are to be filled in by the names of the subject and predicate classes.

		Traditional forms	*Class terminology*
A-form	General:	All ____ are ____	All ____ $<$ ____
	Singular:	X is a ____	X $<$ ____
E-form	General:	No ____ are ____	All ____ $\nless$ ____
	Singular:	X is not a ____	X $\nless$ ____
I-form	:	Some ____ are ____	Some ____ $<$ ____
O-form	:	Some ____ are not ____	Some ____ $\nless$ ____

Every proposition must be stated in one of the forms shown above, for no others can be used in the analysis of categorical syllogisms. We turn now to the analysis of sentences as they are stated in ordinary language. Such sentences may not be in the forms shown above, and we must learn how to make the proper revisions in order to shape the propositions for insertion into the logical machine.

1. Grammatical revisions

Before we analyze a sentence into its class relations, we must clearly identify the subject and predicate. In "Little has been accomplished by fanatics" the subject is "fanatics." "Fanatics," we are saying, "are persons who have accomplished very little." In "All take great risks who put their eggs in one basket" the "who" modifies "all," and the sentence should read, "All persons who put their eggs in one basket are persons who take great risks." The copula ("are") now separates the subject from the predicate.

2. The missing quantifier

We noted earlier that every logical proposition must have a quantifier and must therefore begin with "all," "no," "some," or, in the case of singular propositions, with the name of or reference to an individual thing or person. When no quantifier is stated, assume that the proposition is universal, unless it is quite clear from the context that "some" is intended. Where there is any doubt, assume that "all" is meant. Thus, in "College students are idealists" the speaker must be understood to mean "all." We are not certain that he meant "some." But in "Human beings live until the age of one hundred" it is obvious that "some" is intended.

3. The missing complement

We noted earlier that the *completing complement* must be added to adjectives and other phrases in order to indicate classes. Thus, in "All lions are mild" the predicate term does not clearly indicate a class. "Mild" is not the name of a class. If it were, we would be able to point to its members, but we cannot point to a "mild." However, when we add the completing complement "creatures" or "animals," our sentence will clearly refer to two classes of things. The proposition must clearly indicate that the circle representing the subject can be drawn inside another circle representing the predicate, and each circle must be named by a noun which designates a class of things.

In a sentence such as "Militarists are losing ground," "losing ground" is not a noun which names a collection of things. We must add the complement "persons who are," and we then have the class: "persons who are losing ground." But do not add complements when classes are clearly designated, since the simplest adequate statement is the most desirable. Note, too, that the subject term may also require its complement, as in "The foolhardy are losers." Add "persons" to "foolhardy" and add the quantifier "all," and we get "All foolhardy persons are losers."

Exercises

Restate the following sentences so that the subjects and predicates will clearly refer to classes of things, i.e., groups or collections of persons or things. Do not add complements to nouns. Where necessary, add expressions such as "things which are _____" or "persons who are ________," but where such simple words as "persons" or "things" are sufficient, you will simplify your statement by limiting yourself to a one-word complement. Also add the quantifier where it is missing.

1. Movies are entertaining.
2. She is a blonde.
3. The members of the orchestra are tuning their instruments.
4. The reflective are philosophers.
5. The narrow-minded are prudes.
6. Short skirts are on the way out.
7. Bobby-soxers are disappearing.
8. Those who are loyal to their country are patriots.
9. Blessed are the meek.
10. Happy are they who enjoy their work.

4. The missing copula

Many sentences omit the copula. We must supply it in such cases. Thus, in "Some fish fly" the copula is missing, and we must also add the complement to the predicate. The sentence will then read, "Some fish are flying creatures." Note that the operation of supplying the copula is always a two-fold one, since the completing complement will always be required for the predicate term and perhaps for the subject as well.

Another example: "Some ancient Oriental peoples worshipped the sun." We must supply the copula and add the complement so that the predicate will clearly indicate a class. Restated it reads, "Some ancient Oriental peoples are persons who worshipped the sun."

The following suggestion may be helpful to the student: Always identify the subject first, i.e., the complete subject. The copula should be stated immediately after the subject term. If you have difficulty in recognizing the subject in some cases, look for the main verb, and the subject will immediately precede it.

Exercises

Restate the following sentences by supplying the copula, complements, and quantifier when necessary. Express the copula in the forms of "are" and "included in the class of" (<). Be sure that the predicate is stated in the plural form.

1. Kangaroos jump.
2. Beginners make mistakes.
3. Children like to play games.
4. All atoms contain electrons.
5. Grass grows.
6. Evolution accounts for design.
7. He ridicules others who has never accomplished anything worthwhile.
8. All agree with me who are not ignorant of the facts.
9. They jest at scars who never felt a wound.
10. The people scurried to shelter when they heard the approach of the bombers.

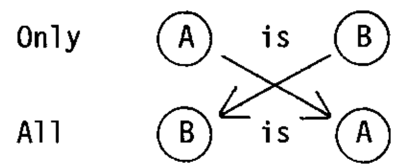
5. Exclusive Propositions

a. The rule of transposition.

An exclusive proposition is one beginning with the words "only" or "none but." "Only men are priests." "None but adults are admitted." Such sentences do not clearly state the relationship of two classes to each other. "Only _____ are _____" is not a permissible form, and it will not be found in the chart on page 63. The subjects and predicates are not clear, and until they are it would be impossible to draw circles to represent these propositions or to fit them into our schedule of appropriate forms and yet retain the same meaning as the original statements.

Take the sentence "Only men are priests." How shall we draw the circles? Obviously we cannot draw a small circle representing men inside a large circle representing priests, for the sentence does not state that *all* men are priests. We therefore require a different type of translation. We require a restatement which can be diagrammed and which will have a meaning equivalent to that of the original sentence. The sentence can be translated into "All priests are men." This carries the meaning of the original sentence and is in proper class form. This simple example gives us our rule of translation: Whenever a sentence is in the form "Only (or none but) S is P" (where S stands for the subject and P for the predicate), we shall change the "only" to "all" and *reverse the order* of the subject and predicate. The exclusive sentence carries the meaning that all of the members of the class denoted by the (original) predicate are included in the class represented by the (original) subject.

A diagrammed statement of this type of translation may be helpful:



or

From the statement: "Only *fools* are *misers.*"

We derive: "All *misers* are *fools.*"

Exercises

Translate the following exclusive propositions into propositions revealing class relationships, by eliminating expressions such as "only" and "none but." The expression "none but" has exactly the same meaning as "only."

1. None but S is P.
2. Only sissies are cry-babies.
3. None but Democrats are New Dealers.
4. Only declarative sentences are propositions.
5. Only persons who suffer from inferiority complexes are persons who wish to dominate others.

b. Procedure for complex cases.

More difficult types of translation are found in sentences in which the completing complement may be missing in one or both terms. The basic procedure to be followed in such translations is as follows:

1. Before we attempt to change the exclusive sentence into an A-form categorical proposition, we should check to determine (a) that each term has its completing complement and (b) that the exclusive sentence has a copula. Be sure that the complements and the copula are present before you proceed.

2. Transpose by reversing the order of the subject and predicate terms around the copula, and add the quantifier "all."

Let us examine some examples, in an increasing order of difficulty:

(i) "Only the narrow-minded are censors." "Narrow-minded" requires the complement "persons" and Step 1 is now satisfied. By Step 2 we have "All censors are narrow-minded persons."

(ii) "Only citizens can vote" requires the copula as well as a complement for the predicate term to satisfy Step 1. It is advisable to add the copula first, immediately after the subject term, viz.: "Only citizens *are* ...." Are what? Obviously "persons who can vote." This completes Step 1. By Step 2: All persons who can vote are citizens.

(iii) "Only the brave deserve the fair" is the most difficult type, for this requires complementing both subject and predicate as well as adding a copula. Follow this procedure to complete Step 1: (1) Add a complement to the subject, then (2) supply the copula, and finally (3) complement the predicate. A problem arises with respect to the predicate noun. It is not "fair persons" for this would fail to account for the words "deserve the." The correct predicate is "persons who deserve the fair," and Step 1 completed gives us: "Only brave persons are persons who deserve the fair." By Step 2: "All persons who deserve the fair are brave persons."

Exercises

Translate the following exclusive sentences into A-form propositions, following the procedures given to you under (b) above.

A. The following examples require complementing the subject, the predicate, or both. Do not add complements to nouns.

1. None but the unhappy are geniuses.
2. None but the imaginative are poets.
3. Only the curious are wise.
4. None but good citizens are desirous of the general welfare.
5. Only those who put others at ease are really polite.
6. None but gentlemen are deserving of the fair.
7. Only those who suffer from inferiority complexes are aggressive.

B. The following require adding the copula as well as completing complements:

8. Only religious persons pray.
9. Only women bear children.
10. Only vulgar persons talk like that.
11. None but cowards die more than once.
12. Only the curious get burned.
13. Only the musical appreciate modern music.
14. Only the brave deserve the fair.
15. Only those who can, do.

6. Negative sentences

Like other sentences in ordinary language, negative sentences may lack complements and copula, and these must then be supplied in order to fit such sentences into the "logical machine." Such sentences should be restated as standard E- or O-forms. Negative sentences also present special types of linguistic problems.

The quantifiers "none" or "nothing" indicate E-forms. "None of the greedy are happy" has a copula, so we need only change "none of" to "no," add complements to subject and predicate, and we get "No greedy persons are happy persons." "Nothing human frightens me" requires a copula as well as complements for subject and predicate, viz.: "No human things are things which frighten me."

The exact meaning of an E-form becomes clearer when we translate "No S are P" into "All S $\not\subset$ P." In class-analysis form our two E-forms will read: "All greedy persons $\not\subset$ happy persons" and "All human things $\not\subset$ things which frighten me."

We shall now examine a type of sentence which is ambiguous in its construction, i.e., amphibolous. Take, as example, *"All* Polynesians *are not* easygoing." Note carefully that this sentence is not in strict E- or O-form. Its structural skeleton is "All _____ are not _____." No such skeletal form will be found in the chart on page 63. This means that the sentence does not assert a precise relationship between two classes, since there are only four ways in which this can be done. Because only sentences in the four structural forms will fit into our "logical machine," we must therefore find, if possible, an E- or O-form equivalent.

We shall adopt the convention that sentences which present the "All ____ are not ______ " formation will be rephrased as O-forms, unless an E-form is obviously intended. Simply change the "All" to "Some." Our example rephrased: "Some Polynesians are not easygoing persons." This rule is in accordance with customary usage. "All Russians are not communists" means "Some Russians are not communists" not "No Russians are communists." "All _____ are not _____" usually means "Not all _____ are _____," i.e., "Some _____ are not ____." But occasionally an E-form is intended, as in "All men are not sinless." This should be rephrased as "No men are sinless."

In the absence of a quantifier a negative sentence usually indicates an E-form as in "Misdemeanors are not crimes." This obviously means "No misdemeanors are crimes."

Exercises

Restate the following negative sentences in strict E- or O-forms. Add complements and the copula where necessary. Restate each E-form proposition in the two forms "No S is P" and "All S $\not\subset$ P."

1. No sparrows sing.
2. No Englishmen make good coffee.

3. Men are not sinless.
4. All labor leaders are not idealists.
5. All the students in this class will not get A's.
6. None of those who violate the rules will receive special consideration.
7. None of the faint-hearted were present at our great victory.
8. Nothing which makes sense is beyond my comprehension.
9. All who proclaim devotion to ideals are not sincere.
10. All that glitters is not gold.
11. The selfish individual is not a lover of his fellow-men.
12. Shostakovich's Fifth is not as great as Beethoven's Fifth.
13. No prejudiced person is included in the class of Christians.
14. What is not considered proper is not always wrong.
15. Plays cannot be judged by merely reading them.

7. Exceptive sentences

Translating an "exceptive" sentence into standard form requires more complex procedures than we required in our other translations.

A sentence of the form "All *except* A are B" (or "All *but* A are B") means that only A's are not B's.* "All but lazy students will graduate," means "*Only* lazy students will *not* graduate." If we translate this into an A-form we get "All students who will not graduate are lazy."

But this translation does not convey the entire meaning of "All but lazy students will graduate." If we combine this sentence with "John is a lazy student" as a minor premise we could not logically draw the conclusion that John will not graduate, for the two premises contain an undistributed middle term. Now, though the meaning of an exceptive sentence is somewhat ambiguous in this respect, the usual interpretation would be that our exceptive sentence contains "No lazy students will graduate" as part of its meaning. Since this meaning is not contained in "All students who will not graduate are lazy," we must add the second meaning to the first in the form of a conjunctive sentence (one which joins two propositions by the conjunct "and") as follows: "All students who will not graduate are lazy *and* no lazy student will graduate."

The following procedure is used in translating exceptive sentences:

(1) Translate "All but A is B" into an exclusive sentence, and negate the predicate term, viz.: "Only A's are not B's." In categorical form we have "All not-B's are A's."

(2) Translate "All but A is B" into an E-form, with the original subject and predicate, viz.: "No A's are B's."

(3) Now combine the two translations into a single conjunctive proposition: "All not-B's are A's, and no A's are B's."

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*This form of translation was suggested to me by Professor Donald Cliver of the University of Missouri.

As we shall learn in the next section, "No A is B" is the equivalent of "All A is not-B" (or "non-B"), and so we can restate our conjunctive proposition as:

"All non-B's are A's, and All A's are non-B's."

Exercises

Translate the following exceptive sentences by following the procedure outlined above.

1. All but science majors take General Science.
2. All but military personnel were evacuated.
3. All except those who repent will be damned.
4. In 1947 the Ford Motor Company, for the first time in its history, permitted smoking by employees during working hours. The announcement read: "All employees except women office employees may smoke."

Section III: Equivalent Propositions

Different sentences may express exactly the same thoughts and meanings. They will then express equivalent propositions. Thus the sentence "Hitler is dead" has the same meaning as "Hitler is not alive"; "No men are angels" has the same meaning as "No angels are men"; and "All just men are unprejudiced" means the same as "All prejudiced men are unjust." The three pairs of propositions we have just noted are examples of the logical processes called "obversion," "conversion," and "contraposition," the subject matter of this section. Though our immediate concern with these processes lies in the equivalences of language, we shall also note that these are also processes of reasoning, usually called "immediate inference." "Immediate" here means that we draw inferences from a single proposition, as distinguished from syllogistic, or "mediate" inference, in which we draw a conclusion concerning two classes because of their relation to a third class that "mediates" the inference.

The study of equivalent propositions has many values, not least of which is the realization that there is more than one way of stating the truth. In the search for truth it is not the language that is important but the ideas expressed. A difference in verbal formulation does not mean that there is a difference in meaning. We often find that apparent differences of opinion disappear when we learn that the difference is merely one of verbal formulation. This study will make us more keenly aware of equivalences in meanings, an awareness of which will be found indispensable in the analysis of many arguments.

1. Obversion

Obversion is a process whereby we change a proposition into its equivalent by *changing* its *quality* (but not its quantity), and by *negating* its *predicate.*

Example:	A-form	All men are fallible.
	E-form	No men are infallible.

The A-form obverts into the E-form. The E is thus the obverse of the A.

These two propositions have exactly equivalent meanings. Note that the obverse contains two negations. We changed the proposition from affirmative A to negative E, and we negated the predicate from "fallible" to "infallible." The basic principle underlying this process is that two negations result in a positive statement, similar to the "double-negative" rule in grammar. The child who says "I ain't got none" is, strictly speaking, saying that he does have some, though we will not usually mistake his meaning. "He did not fail to attend" means that he did attend. In algebra, too, we learned that the multiplication of negative numbers results in a positive number. The same principle also applies with respect to terms. The negation of "infallible" is "fallible"; the negation of non-combatant is "combatant."

We shall now introduce a new symbol "$\sim$" called the "tilde," or sign of negation. Its verbal equivalent is "non," "in-," "un-," "im-," etc. If "B" stands for "fallible persons" then "$\sim$B" stands for "non-fallible persons." We may thus express obversion symbolically as follows:

All A are B.
obverts into: No A are $\sim$B.

Note the two steps: (1) Change the universal affirmative A-form into the universal-negative E-form (change quality, never quantity), and (2) negate the predicate term. (Do not tamper with the subject term!)

Note that "All C are $\sim$D" obverts into "No C are D." The negation of $\sim$D is $\sim\sim$D, and the latter is the same as D.

The table on page 72 shows the manner in which all four types of propositions are obverted. Note (1) that there is no change in the quantity of the proposition, Universal propositions remain universal; particulars remain particular. (2) The quality of the proposition changes from affirmative to negative and vice-versa. (3) The predicate term is negated. (4) The subject term remains unchanged.

Two further points should be noted. (5) Examine carefully the obversion of I- and O-forms. The change in quality that takes place by changing "are" in the I-form to "are not" in the O-form, and vice-versa, is an operation entirely distinct from that of negating the predicate term. (6) Note the simplicity of the operations of obversion as stated in the "class-analysis" symbols. Only two operations are required. (1) We change $<$ to $\nless$ (or vice-versa) and negate the predicate symbol. (Due allowance must of course be made for changes in the signs of distribution in the predicate term when we go from affirmative to negative and from negative to affirmative.)

Original A Obverse E	Ad < Bu Ad $\nless$ $\sim$Bd	All A are B. No A are $\sim$ B.	All men are mortal. No men are non-mortal.
Original E Obverse A	Ad $\nless$ Bd Ad $\nless$ $\sim$Bu	No A are B. All A are $\sim$B.	No liberals are appeasers. All liberals are non-appeasers.
Original I Obverse O	Au < Bu Au $\nless$ $\sim$ Bd	Some A are B. Some A are not $\sim$B.	Some bankers *are* golfers. Some bankers *are not* non-golfers.
Original O Obverse I	Au $\nless$ Bd Au < $\sim$Bu	Some A are not B. Some A are $\sim$ B.	Some Communists *are not* Russians. Some Communists *are* non-Russians.

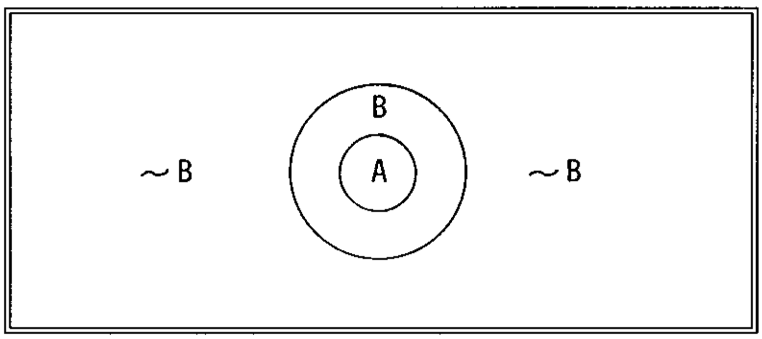
When we obvert sentences in ordinary speech, difficulties may arise concerning the proper negation of the predicate term. It is, in general, preferable to negate by the prefix "non-," which express simple negation, rather than by prefixes such as "un-" and "in-" which often express antitheses, or words of contrary meaning. Consider "He is trustworthy" and "He is not untrustworthy." "Not untrustworthy," or the "not-un-" formation in general, appears to express a lack of certainty, though many people, especially the British, use this type of expression to express obversion. When the British send communiques from war fronts announcing that they "were not unsuccessful," they mean that they were successful. To be safe, use the prefix "non," though other prefixes may sometimes correctly express simple negation. Note also that the simple negation of "large" is "non-large," *(not* "small"); the negation of "rich" is "non-rich," *(not* "poor"). People may be "non-rich," though far from poor.

Exercises

1. Obvert the following:
    a. Some X is Z.
    b. No L is M.
    c. Some R is not S.
    d. All $\sim$ A is $\sim$ B.
    e. Some R is not $\sim$ S.
    f. All puns are crimes.
    g. Some Chicagoans are gangsters.
    h. No planets are stars.
    i. Some books are not texts.
    j. Some chess players are non-athletes.
    k. All nonappeasers are wise men.
    l. No nonreaders are nonflunkers.
    m. Only A is B.
    n. Only the brave deserve the fair.
2. Obvert: Germany invaded Russia on June 22, 1941. (Restate in logical form before you obvert. Remember too that a singular subject has no

quantifier.)

3. Additional examples, if desired, will be found on page 34.
4. Are the following inferences justified? If not, which rule of obversion was violated?
   a. All volunteers are patriots. Hence, all non-volunteers are unpatriotic.
   b. All anonymous donors are wholly unselfish, so donors who sign their names are not wholly unselfish.
   c. All letter writers who refuse to sign their names are cowards. Therefore, no writers who sign their names are cowards.
5. It is a useful exercise to draw circles in order to see why the obverse has the same meaning as the original proposition. Thus, if "All A is B," then the area outside the B circle is "$\sim$B," and since no A is outside the B circle, it follows that "No A is $\sim$B." In the diagram:



   Draw and explain similar diagrams for the E-, I-, and O-forms.

2. Conversion

"No men are angels" has exactly the same meaning as "No angels are men." For obviously, if all men are excluded from the entire class of angels, then all angels must be excluded from the entire class of men. The two propositions are equivalent in meaning, though the order of their subjects and predicates is reversed. The subject of the first proposition has become the predicate of the second. The process whereby we pass from one proposition to another by reversing the order of the subject and predicate is called "conversion." This process is a legitimate one when the second proposition has the same quantity and quality as the first and when there is no "illicit distribution" of terms in the second proposition. When we apply this process to the A-E-I-O forms, however, we shall see that the E-forms and I-forms convert simply; A- and O-forms do not. A special kind of conversion may be applied to A-forms, however, as we shall note. Let us look at each form separately.

The E-form. An E-form may be converted, as in the example above, into a new proposition exactly equivalent in meaning to the original proposition. If all of A is excluded from B, then all of B must be excluded from A.

The I-form. "Some Americans are Communists" also means that "Some Communists are Americans." The original sentence states that there are some individuals who are both Americans and Communists. Obviously, then, there are some individuals who are both Communists and Americans. This gives us the rule that an I-form can be converted into a converse that is exactly equivalent to the original sentence. If some A are B, then some B must be A. If circle A overlaps B, then circle B overlaps A.

The A-form. Can we convert "All dogs are animals" into "All animals are dogs?" Obviously not. "All A is B" cannot be converted into "All B is A." But we can perform an operation on A-forms which is called "conversion by limitation." "All dogs are animals" can be converted into "Some animals are dogs." "All A is B" can be converted into "Some B is A."* Thus the "conversion by limitation" of an A-form yields a *partial* converse. It is important to note, however, that conversion by limitation gives us a new proposition that is *not equivalent in meaning* to the original one.

The process of distribution will explain why A-forms cannot be converted simply, like E- and I-forms. An E-form distributes both terms, and so does its converse. In the I-form, both terms are undistributed; similarly in the converse. But in the A-form, the predicate is undistributed, and if we convert it simply (i.e., without limitation), the original undistributed predicate would be distributed in the converse, as in going from "Ad < Bu" to "Bd < Au." The general rule of conversion with respect to distribution is that the converse must not distribute a term that was undistributed in the original proposition (cf. Rule 2 of the syllogism). The fact that we have information concerning *some* members of a class does not warrant an assertion concerning *all* of its members.

One further point. In formal logic we are interested in valid inferences. We have stated the rule that "All A is B" cannot be converted into "All B is A." But suppose we have an A-form such as "All triangles are three-sided figures." We know that B is A in this case, i.e., that all three-sided figures are triangles. We may use this information as we please, but we did not derive this information by a formal logical process from "All triangles are three-sided figures." A formal logical process is concerned with form, not with content (or outside knowledge), and it is formally illegitimate to derive "All B is A," from "All A is B." To say this is illegitimate simply means that the latter might be true, and the former false. This is what is meant by "invalid argument."

The O-form. Can we convert "Some women are not mothers" into "Some mothers are not women"? Obviously not. The rule: An O-form cannot be validly converted. To do so would result in an illicit distribution of the original subject term, for we would go from "Au $\nless$ Bd" to "Bu $\nless$ Ad." The subject A would be undistributed in the original and distributed in the converse.

Once again we note that outside information may tell us that the converse of an O-form *happens* to be true. Take the example: "Some students are not women." We also know that "Some women are not students." But the point is

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*The conversion of an A-form requires certain assumptions concerning the existential import of propositions. This problem will be discussed in Chapter 11, Section IV.

that if we are given "Some A is not B," we cannot necessarily conclude that "Some B is not A."

The following table summarizes the possibilities in conversion. Remember that only E- and I-forms convert into equivalent propositions, that A-forms convert by limitation only, so that the converse is not equivalent to the original proposition and that the O-forms do not convert at all. Note also that the *singular* A- and E-forms are not usually convertible.

	E-form	*I-form*	*A-form*
Original	No A is B ($Ad \nless Bd$)	Some A is B ($Au < Bu$)	All A is B ($Ad < Bu$)
Converse	No B is A ($Bd \nless Ad$)	Some B is A ($Bu < Au$)	Some B is A ($Bu < Au$)

Exercises

1. Convert the propositions in Exercise 1 in the preceding exercises.
2. Are the converses of the following propositions justified?
    a. All communists praise Russia, so those who praise Russia must be communists.
    b. Since some Germans were not Nazis, it follows that some Nazis were not Germans.
    c. Some Indians are non-Hindus, so some non-Hindus are Indians.
    d. No New Dealers are conservatives. Then no conservatives are New Dealers.
    e. All movies are masterpieces, so some masterpieces must be movies.
3. Are the following examples of conversion formally justified? Are the converses true in fact? Explain your answer.
    a. All men are rational beings. Therefore, all rational beings are men.
    b. Some baseball players are not golfers, so some golfers are not baseball players.
    c. Some coins are not pennies, so some pennies are not coins.
    d. Some human beings are not professors, so some professors are not human beings.
4. Convert: Americans enjoy a higher standard of living than Europeans.
5. Of which error in conversion is Alice guilty, according to her logical friends in Wonderland?

    The Hatter asked, "Why is a raven like a writing desk?"
    Alice replied, "I believe I can guess that."
    "Do you mean that you think you can find out the answer to it?" said the March Hare.
    "Exactly so," said Alice.
    "Then you should say what you mean," the March Hare went on.
    "I do," Alice hastily replied; "at least-at least I mean what I say-that's the same thing, you know."
    "Not the same thing a bit!" said the Hatter. "Why, you might just as well say that 'I see what I eat' is the same thing as 'I eat what I

see'!"
"You might just as well say," added the March Hare, "that 'I like what I get' is the same thing as 'I get what I like'!"
"You might just as well say," added the Dormouse, which seemed to be talking in its sleep, "that 'I breathe when I sleep' is the same thing as 'I sleep when I breathe!"
(Hint: "I mean what I say" means "The things which I say are the things which I mean.")

3. Contraposition

The contrapositive of a proposition is the obverse of its converted obverse. To obtain the contrapositive we must perform three steps: obvert, then convert, then obvert once again. Let us illustrate this three-step procedure by an example of contraposition:

Original	All metals	are conductors.	All M are C.
1. Obvert:	No metals	are non-conductors.	No M are ∼ C.
2. Convert:	No non-conductors	are metals.	No ∼ C are M.
3. Obvert:	All non-conductors	are non-metals.	All ∼ C are ∼ M.

This process may be applied to all A-form propositions, without exception. Note the symbols with which we begin and end: "All M are C" becomes "All ∼ C are ∼ M." The contrapositive of an A-form is thus another A-form, with the original subject and the original predicate reversed in order and both negated. The contrapositive of "All S is P" is "All ∼ P is ∼ S." The contrapositive of "All wizards are magicians" is "All non-magicians are non-wizards." The student should learn how to perform this process in both the one step and in the three step procedure.

The contrapositive of an A-form is always equivalent in meaning to the original proposition. This must be the case, since the obverse of all A-form (1), the converse of an E-form (2), and the obverse of an E-form (3) are equivalent to the propositions which are obverted and converted. The contrapositive of an O-form also results in an equivalent proposition. Thus, "Some A is not B" is equivalent to "Some ∼ B is not ∼ A." The E-form yields a partial contrapositive, and the I-form has no contrapositive. But we shall find little occasion to use contraposition except in the A-forms and will therefore not discuss this operation further.

Exercises

1. Exercises on contraposition: State the contrapositives of the following A-forms before you work out the three steps, and then prove your answer through the three steps:
   a. All Brahmins are Hindus.
   b. All communists are subverters.
   c. All men are mortal.
   d. All persons who fail in logic are non-studious.
   e. Only members are admitted.

2. On equivalence: Which of the following pairs are equivalent to each other? (The test of equivalence is whether or not you can translate back into the original proposition):
   a. All A are B and All ~ B are ~ A.
   b. All A are B and All ~ A are ~ B.
   c. All A are B and No ~ B are A.
   d. Some A are not B and Some B are not A.
   e. Some A are not B and Some ~ B are not ~ A.
3. On equivalence: Match the numbered proverbs with the lettered proverbs below. Do you regard the matched proverbs as having equivalent meanings?
   (1) It never rains but it pours.
   (2) Kind hearts are more than coronets.
   (3) Just as the twig is bent the tree's inclined.
   (4) Know thyself.
   (5) Carrying timber into a wood.
   (6) First come, first served.
   (7) Faint heart ne'er won fair lady.
   (8) A tempest in a teapot.
   (9) Don't put off until tomorrow what you can do today.
   (10) He who fights and runs away may live to fight another day.
   (11) Make hay while the sun shines.
   (12) Every man to his own taste.

   (a) Discretion is the better part of valor.
   (b) Troubles never come singly.
   (c) A mountain out of a molehill.
   (d) None but the brave deserve the fair.
   (e) There's nothing so kingly as kindness.
   (f) Strike while the iron is hot.
   (g) Like father like son.
   (h) One man's meat is another man's poison.
   (i) Carrying coals to Newcastle.
   (j) The proper study of mankind is man.
   (k) The early bird gets the worm.
   (l) No time like the present.

(From George W. Crane's "Test Your Horse-Sense" Quiz in *The Chicago Daily Tribune.)*

CHAPTER 10

THE SYLLOGISM AND EVERYDAY DISCOURSE

Section I: Syllogisms and Ordinary Discourse

We are now ready to analyze syllogisms as they are stated in ordinary discourse. We have learned how to make the linguistic transformations that are required when the essential relations of subject and predicate are obscured by "irregular" forms of expression. We should now be able to restate the syllogisms of ordinary discourse in the schematic form requisite for clear analysis.

We often reason syllogistically in ordinary discourse, but such syllogisms do not usually follow the pattern of the schematic form. They are more likely to occur in such forms as the following: "Certainly, we ought to have military training for our youth. These are critical times, aren't they? And shouldn't we have military training in critical times?"

We shall analyze syllogisms such as this one. We shall put the propositions into strict A-E-I-O forms, eliminating all unnecessary verbiage, rhetorical questions, etc., and then arrange the propositions in the schematic form we used earlier, with the premises first and the conclusion last. The syllogism above would then take the following form:

All critical times are times when we ought to have military training for our youth.
The present time is a critical time.
∴ The present time is a time when we ought to have military training for our youth.

The structure of this argument is now obvious, as is its validity.

In everyday discourse it is also customary to state an argument incompletely, because it seems unnecessary to state all the details. Someone tells us confidentially, "You know, all drunkards are short-lived. Well, poor John won't live very long." This argument is a syllogism in the form of an "enthymeme" (from two Greek roots meaning "in the mind"), i.e., part of the argument is unstated but understood. We supply the unstated but obvious premise that "John is a drunkard," and we have a complete syllogism.

In this chapter we shall analyze syllogisms as they might occur in ordinary discourse and will make frequent use of the devices for linguistic translations that we studied in the last chapter. As we noted earlier, the rules of the syllogism are easy to apply once we have properly analyzed the linguistic elements. But before we turn to the analysis of syllogisms, we must examine some special linguistic difficulties that arise in connection with the requirement that a syllogism must have three terms.

Section II: A Syllogism Has Three and Only Three Terms

The syllogism has been defined as an argument that has three and only three terms, but as yet we have not discussed the manner in which this requirement may be violated. Blatant violations do not usually occur in ordinary discourse. Thus, no one would be likely to argue in the following manner:

All Englishmen eat roast beef with Yorkshire pudding.
Zoroastrianism is a Persian religion.
Therefore, ______ ________ ______?

Since these two propositions contain four terms, they could not serve as the premises of a syllogism. There would be no middle term. An argument having the appearance of a syllogism, but containing four terms, is usually said to involve the "four-term fallacy." In the strict sense, such arguments are not syllogisms, but it will be convenient to refer to them as syllogisms involving "the four-term fallacy."

Though the four-term fallacy seldom occurs in the crude form of the illustration, it often occurs in a more subtle way. The ambiguity of terms may conceal the fact that a supposed middle term is really no middle term at all, but a word with two quite different meanings. The middle term, in other words, may be used equivocally. Let us look again at an example that we used earlier, on pages 56-57:* "Science has discovered many 'laws of nature.' This is proof that there is a God, for a law implies the existence of a lawgiver, and God is the great Lawgiver of the Universe."

In more schematic form we have the following:

All $laws_1$ are rules which imply the existence of a lawgiver.
The 'laws of nature' are $laws_2$.
The 'laws of nature are rules which imply the existence of a Lawgiver (God).

The middle term "laws" is used equivocally, so this syllogism has four terms. "Laws " is used in the sense of "legal laws," i.e., rules established by a governing body; "Laws " means descriptions of the uniformities among natural events. When we eliminate the equivocal uses of the middle term "laws" and substitute the proper definitions, we find the following argument:

All *rules established by a governing body* are rules which imply the existence of a lawgiver.
The 'laws of nature' are *descriptions of the uniformities of natural events.*
∴ The 'laws of nature' are rules which imply the existence of a Lawgiver (God).

Stated in this way, the four terms are glaringly obvious. But the four terms were not so obvious in the original argument, which had the appearance of a three-term syllogism because of the ambiguity of the word"law."

The student should examine every argument for possible violations of the three-term requirement. Note, however, that mere differences in terminology do not necessarily prove that four terms are used, as when synonymous expressions are used for the middle term, viz.:

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*Original Book's page numbers - these are not reproduced in this work.

Those who believe that the state should be subordinate to the individual are opposed to the dictatorship of the proletariat.
All anarchists are libertarians.
∴ All anarchists are opposed to the dictatorship of the proletariat.

In this argument the middle term is referred to by two different expressions: "libertarians" and "persons who believe that the state should be subordinate to the individual." Since both refer to the same referents, there are in reality only three terms. The term "libertarians" may be regarded as the subject of the major premise.

A merely apparent four-term fallacy may also occur when words of opposite meaning are used in an argument, as in

All front-line fighters are combatants.
All nurses are non-combatants.
∴ No nurses are front-line fighters.

In this syllogism we have apparent violations of both the three-term requirement and Rule 5, that a negative conclusion cannot be drawn from affirmative premises. But here we note a fundamental "rule of courtesy" which should be shown to all syllogisms: Do not assume that a four-term fallacy has occurred unless you have given the writer or speaker the benefit of every doubt. The reader should restate every syllogism as a three-term argument if this can be done without changing its meaning. When we give the last syllogism such courtesy, we find that the minor premise may be obverted into "No nurses are combatants," that there are thus only three terms, and that the syllogism is valid.

A different type of semantical violation of the three-term requirement is illustrated by the following example:

All morally good men are concerned with human welfare.
All virtuous men are morally good men.
∴ All virtuous men are concerned with human welfare.

Though this "syllogism" apparently has three terms, it really has only two since "morally good men" and "virtuous men" are synonymous terms. There is actually no reasoning from premises to a conclusion since the conclusion merely repeats the first premise in different language. Though such arguments are strictly speaking not syllogisms, we may refer to them as syllogisms involving the "two-term fallacy."

The four-term and two-term errors are semantical, rather than formal, in nature. The errors may be overlooked by carelessness in symbolization, as when we use the same symbol for different terms, or different symbols for the same term. We should therefore carefully check the language of every syllogism for possible violation of the requirement that a syllogism must have three and only three terms.

Section III: The Analysis of Syllogisms in Everyday Discourse

We shall now analyze syllogisms as they may occur in everyday discourse. The following procedure will be helpful to you in analyzing the syllogisms of the exercises:

Step 1. Your first task is to state the syllogism in schematic form, with the premises stated first and the conclusion last. To correctly identify premises and conclusion look for the "logical indicators,′ words like "because," "for," "since," which always precede a premise, and words like "hence," "so," "therefore," which introduce the conclusion. (Re-reading Section I of Chapter 6 may be helpful.)

Step 2. Be sure that each proposition in your syllogism is stated in strict logical form. (The possible structures of the standard forms are shown in the table on page 63.) Semantical revisions will be required when the argument uses rhetorical language or rhetorical questions. These irregularities should be eliminated. Make the proper grammatical revisions; add quantifiers, copula, and complements as necessary; translate exclusive and exceptive sentences; and revise negative sentences as required.

Step 3. The first two steps may adequately prepare the syllogism for the application of the rules. But other difficulties may need to be surmounted. You may have difficulty in correctly identifying the terms. When this occurs, carefully examine the conclusion, note its subject and predicate, and then try to find the common term in the premises. Further grammatical revisions may be required. Also recheck to see whether you have done everything required by Step 2.

It will sometimes be necessary to try out various hypotheses concerning the terms until we find the correct ones.

Step 4. Remember the "rule of courtesy" when the syllogism seems to have more than three terms. Use the rules of equivalence to obvert, convert, or contrapose in order to eliminate extra terms. Assume that the speaker had only three terms in mind until you have exhausted these precautions.

Step 5. Your syllogism is now stated in the proper schematic form. Symbolize the terms, show signs of distribution, gather the symbols together in class-analysis form for a symbolic statement of the structure of the syllogism, and analyze for validity.

Exercises

Restate the following syllogisms according to the instructions found in the five steps, and analyze for validity.

1. Since only citizens can vote, John must be able to vote, for he is a citizen.
2. Only the productive can be free, for only the productive are strong, and only strong people are free.
3. Since only the lucky make strikes, I must conclude that I am a very unlucky bowler, for I have not made a strike all winter.

4. Whatever is perceived by the senses is undoubtedly a fact. Then the existence of the soul cannot be a fact, since no one has ever perceived the soul by the senses.
5. Many great men have done very poorly in their studies while they were at college. I got low grades last semester. Can it be that I am a great man?
6. Decent newspapers cannot attain a wide circulation, for they decline to emphasize sensational material such as illicit love affairs and murders. We all know that papers which adopt such sensational methods invariably attain a wide circulation.
7. From Samuel Johnson's *Life of Cowley:* "Because the father of poetry was right in denominating poetry...an imitative art, these (metaphysical poets) will, without great wrong, lose their right to the name of poets.. for they copied neither nature nor life."
8. The medical profession informs us that some stimulants are harmful to the human body. Everybody knows that all types of alcoholic liquor are stimulants; it follows, therefore, that some types of alcoholic liquor are harmful to the human body.
9. Nothing that makes sense ever puzzles me, and some of these exercises are quite puzzling. These exercises simply do not make sense.
10. The attorney for the defense argued; "It is a rule of the company by which my client was employed as a signal operator that express trains alone do not stop at his station. Now, the train in question stopped at his station, so he was undoubtedly correct in assuming that it was not an express train."
11. Every scientist will agree that true theories are theories which are confirmed by experiments. Now, we know that carefully formulated scientific experiments have confirmed Einstein's theory of relativity. Therefore it must be a true theory.
12. No unambitious people are successful, so no successful people are hedonists, for all ambitious people are non-hedonists.
13. No aggressive people are conscientious objectors, and all unaggressive people are friendly, so all unfriendly people are non-conscientious-objectors.
14. All Eskimos live in snow houses, and all people who like to live in snow houses would dislike our modern conveniences, so all Eskimos would dislike our modern conveniences.
15. All human beings are mortal, and all members of the genus homo sapiens are human beings, so all members of homo sapiens are mortal. (Does this example have three terms?)
16. The Dean says that all except the students with less than a "C" average will graduate. If you know that John has less than a "C" average, can you draw the conclusion that John won't graduate?
17. The *Digest* publishes what it considers the most interesting material that people want to read. Now, we know that an article doesn't have to be true in order to be interesting, and, since this magazine tries to publish interesting stories, we may conclude that its articles and stories are not entirely true.
18. If an argument is valid, and the conclusion is false, then a premise must be false. If we assume this principle then I can prove the falsity of A. E. Houseman's theory that good poetry can be recognized by "the thrill down our spine." *(The Name and Nature of Poetry)*. For though his own

poetry is certainly good poetry, it does not send a thrill down my spine.

19. A Republican senator said that he disagreed with his party's chairman on key questions on domestic and foreign policy. If so, the chairman replied, then the senator is not a Republican, for the policies with which the senator disagrees are those for which the Republican party stands in the nation.
20. All who were present at the college senate meeting were members of the faculty, so I am justified in saying that no one present was not a member of the senate, since only faculty members belong to the senate.
21. If there is no reason to suppose that all his actions were praiseworthy and every reason to admit that no act is virtuous if it is not praiseworthy, then you can't argue that his actions were all virtuous.
22. The Eskimos are the only people who eat nothing but meat, and it is found that all Eskimos have good teeth. So we may conclude that no people who eat only meat have bad teeth.
23. A man is ennobled by the experience of finding himself faced by the choice between life and death. War provides the supreme situation in which men have to make this choice, so that if universal and perpetual peace could be attained, it would be at the price of robbing men of all ennobling experiences. (Thouless.)
24. Find a valid conclusion which would follow from the following premises: All of the incoming women freshmen at Indiana University disapprove of young men who neglect their studies in order to ride around in their flashy convertibles, and none of the incoming women freshmen at Indiana University seek to marry husbands who take the policies of either of the two major parties very seriously. Therefore?
25. It is well-known fact that there are many pacifists in the U.S. today, and only people who are in favor of appeasing Russia are members of this peculiar sect. The pacifists feel that it is better to appease Russia than to go to war, even though appeasement may mean that communism will control the entire globe that we inhabit. Now, there is absolutely no question but that some persons who favor the appeasement of Russia are anything but loyal American citizens. The appeasers to whom I refer are in reality pro-communist, and they want Russia to take us over. Their talk about their desire for peace is nothing but a pretense. What these people really want is for us to disarm and thereby give Russia an easy path to conquest. It is thus apparent that at least some, even if not all, pacifists can hardly be considered to be good American citizens.

Section IV: The Enthymeme

"Roosevelt made mistakes, for he was only human." This sentence states a syllogism in the form of an enthymeme, which we define as an incompletely stated syllogism. Only part of the complete argument is explicitly stated, the remainder being "within the mind." Completed, the argument would look like this:

All human beings make mistakes.
Roosevelt was a human being.
∴ Roosevelt made mistakes.

In everyday discourse we will find that syllogistic arguments are frequently stated in the form of enthymemes. In the example above it was unnecessary to state the major premise, "All human beings make mistakes," since it was obviously implied, and most speakers try to avoid "belaboring the obvious." Many arguments will be found to contain such unstated assumptions. Frequently, however, such assumptions are false or unjustified, and it is therefore important that we make our assumptions explicit so that we may critically examine what is being assumed. This can be done only by completing the enthymeme.

Ethymemes may be classified into "Orders," to indicate the part or parts which are missing. There are four such Orders as follows:

1. Major premise omitted

The illustration above omitted the major premise. Another example: "This cough syrup should help me, for it helped a man in St. Louis. I read his testimonial." The major premise, "Whatever helped a man in St. Louis will help me," is assumed.

2. Minor omitted

"Roosevelt will make mistakes, because all men make mistakes." The minor premise is missing here: Roosevelt is a man.

3. Conclusion omitted

"All men make mistakes and the President is a man." The conclusion is obvious, but unstated. Another example, as told by Thackeray: "An old abbé, talking among a party of intimate friends, happened to say, 'A priest has strange experiences; why, ladies, my first penitent was a murderer.' Upon this, the principal nobleman of the neighborhood enters the room. 'Ah, Abbé,' here you are; do you know, ladies, I was the Abbe's first penitent, and I may promise you my confession astonished him.'"

4. The minor premise and the conclusion are omitted

This type is rarer than the others. It requires the *context* of a situation which indicates that an argument is intended. For example, assume that you are talking to a person whose boasting annoys you. You say, "Only an insecure person boasts about his achievements." Your hearer will supply the minor premise and the conclusion. The complete syllogism will read as follows:

All persons who boast about their achievements are insecure persons.
You are boasting about your achievements.
∴ You are an insecure person.

The person of validity in the enthymeme must now be considered. In all of the examples considered, we completed the enthymeme into a valid syllogism. But consider the following: "Why do I say that X is a communist? He opposes loyalty oaths for teachers, doesn't he?" This is an enthymeme of the First

Order, since the major premise is omitted. But what is the major? There are two possibilities: (1) All communists are opposed to loyalty oaths for teachers, or (2) All persons opposed to the loyalty oaths for teachers are communists. It is likely that the first interpretation was intended, in which case the argument would be invalid, since the middle term would be undistributed. If the second interpretation were intended, then the argument would be valid, but the falsity of this premise would be quite apparent. When one is in doubt as to which interpretation is intended, the argument should be analyzed in terms of both possibilities. Note also that questions concerning the truth of a premise are problems of material, not of formal logic.

Invalid enthymemes in other Orders will be quite obvious. The following is in the Second Order: "All Republicans believe in free enterprise, so you do not believe in free enterprise." This example contains an illicit major. A Third Order example: "All guilty individuals fail to pass the lie-detector test, and he failed to pass it." This argument contains an undistributed middle term.

Exercises

A. Complete the following enthymemes in strict categorical form. Each should be stated as a valid syllogism, unless it is obvious that an invalid argument was intended. State whether each is valid or invalid, and note the Order of the enthymeme. Linguistic irregularities should be handled as before. Note particularly, however, that the complete argument should have three terms, not four, five, or even six terms. It will be found helpful, in complying with the three-term requirement, to symbolize the subject and predicate of the conclusion by "S" and "P." Then find "M." Be sure that each term is stated in identically the same manner each time it is used.

1. This must be a good book-it was chosen by the Book-of-the-Month Club.
2. Liberals believe in freedom of speech, so he is not a liberal.
3. Remark made to an aggressive person: "When anyone acts aggressively it usually means that he is suffering from an inferiority complex."
4. All Republicans are against the "police state" so you must be a Republican.
5. Naturally, I consider him an intelligent man. He's a Democrat, isn't he?
6. Generals are notoriously poor chess players. I also play the game badly.
7. Don't take logic. You will have to work out a lot of exercises.
8. I don't see why I should be required to study Latin. Aren't all the worthwhile books translated into English?
9. We should have "socialized medicine" in the United States. Hasn't it worked well in England?
10. Robespierre's enemies accused him of having identified the "enemies of the state" with his personal enemies. "I deny the accusation," he answered, "and the proof is that you still live."

B. State any set of two premises which will validly lead to the following conclusions (find a middle term):

1. No logical exercises are too easy.
2. Some payments for services rendered are not contemptible.
3. On rainy days, I dine alone.
4. Omar wished to remould this sorry scheme of things nearer to the heart's desire.

Section V: The Sorites

The sorites (rhymes with "nighties") is a series of syllogisms telescoped into one argument, as in the following:

	All young men are idealists.	All Y are I.
	All idealists are sensitive creatures.	All I are S.
	All sensitive creatures are dissatisfied.	All S are D.
	<u>All dissatisfied creatures are unhappy.</u>	<u>All D are U.</u>
∴	All young men are unhappy.	∴ All Y are U.

In this argument the first two premises lead to an unstated conclusion; namely, that "All young men are sensitive creatures." This unstated conclusion is then combined with the third premise, to yield the unstated conclusion that "All young men are dissatisfied," and so on. In other words, the conclusion of one syllogism is the premise of another, and all conclusions except the final one are unexpressed. The premises are so arranged that any two successive ones will contain a common term.

This form of the sorites is called the Aristotelian type. A second type, called the Goclenian sorites, proceeds in this way:

	All living things are mortal.	All L are M.
	All animals are living things.	All A are L.
	<u>All cats are animals.</u>	<u>All C are A.</u>
∴	All cats are mortal.	∴ All C are M.

In the Aristotelian type, the first premise contains the subject of the conclusion, and the common terms of the premises appear first as a predicate and then as a subject. In the Goclenian type, the first premise contains the predicate of the conclusion, and the common term appears first as subject and then as predicate. Special rules for these sorites are as follows:

1. If negative premises are used, no more than one premise can be negative. In the Aristotelian sorites, it must be the last premise; in the Goclenian, the first.
2. No more than one premise may be particular or singular. If such premises are used, they must come first in the Aristotelian form, and last in the Goclenian.

Every sorites, however, may be stated in either form. The Goclenian sorites may be translated into the Aristotelian type by proceeding backwards from the last premise.

Exercises

1. Construct a valid Goclenian sorites having four propositions and containing a negative premise and a singular premise. Then restate in the Aristotelian form.
2. Classify the following sorites with respect to its form. Is it valid?

   The human soul is a thing whose activity is thinking. A thing whose activity is thinking is one whose activity is immediately apprehended and without any representation of parts therein. A thing whose activity is immediately apprehended without any representation of parts therein is a thing whose activity does not contain parts. A thing whose activity does not contain parts is one whose activity is not motion. A thing whose activity is not motion is not a body. What is not a body is not in space. What is not in space is insusceptible of motion. What is insusceptible of motion is indissoluble (for dissolution is a movement of parts). What is indissoluble is incorruptible. What is incorruptible is immortal. Therefore, the human soul is immortal. (Leibniz, *Confessio Naturae Contra Atheistas*, translated by H. W. B. Joseph, *An Introduction to Logic*, The Clarendon Press, pp. 355-6.)

3. The following examples of sorites are taken from Lewis Carroll's *Symbolic Logic*. Rearrange the premises in the Aristotelian order, making semantical changes as required:

   a. All babies are illogical.
      No one is despised who can manage a crocodile.
      Illogical persons are despised.
      ∴ No babies can manage crocodiles.
      (Hint: Symbolize each proposition by appropriate letters ("B" for babies, etc.) and then join premises having common terms.)
   b. No terriers wander among the signs of the zodiac; Nothing that does not wander among the signs of the zodiac is a comet; Nothing but a terrier has a curly tail. ∴ All creatures with curly tails are non-comets.
   c. Which conclusion may validly be derived from the following premises? All writers who understand human nature are clever; no one is a true poet unless he can stir the hearts of men; Shakespeare wrote Hamlet; No writer who does not understand human nature can stir the hearts of men; none but a true poet could have written Hamlet.
4. The following case may explain the reluctance of automobile dealers to sell cars to minors (legal infants):

   On 21 April, 1928, the plaintiff, being a minor, entered into a contract with the defendant, by the terms of which he traded a Chevrolet truck, valued at $250, for a Dodge sport roadster, valued at $659.50. On 21 May, 1928, the plaintiff made a payment of $40.95 on his note. Thereafter the Dodge sport roadster was destroyed in a wreck; whereupon the plaintiff elected to disaffirm his contract, and now sues to recover $290.95, the sum of the value placed upon the Chevrolet truck at the time of the trade, to wit, $250 and the payment of $40.95 subsequently made on the note.

Stacy, Chief Justice: When an infant elects to disaffirm a contract, relative to the sale or purchase of personal property, other than one authorized by statute, or for necessaries, what are the rights of the parties?

(1) An infant may avoid such a contract, either during his minority or upon arrival at full age...
(2) Upon such avoidance, the infant may recover the consideration paid by him...with the limitation that he must restore whatever part of that which came to him under the contract he still has...
(3) Where the infant parts with personal property, he may, upon disaffirmance, recover the value of such property, as of the date of the contract.

In the instant case the plaintiff is entitled to recover the $40.95 which he paid on his note, together with the fair market value of the Chevrolet truck at the time of the trade. (Collins v. Norfleet-Baggs, Inc., Supreme Court of North Carolina, 1929.)
(Hint: Sum up the decision and the law in this case as stated by the Chief Justice in the form of an Aristotelian sorites. Begin with the singular premise: The plaintiff < infants, etc.).

Section VI: The Relations between Terms Generalized

We have now completed our discussion of categorical syllogisms involving the relationship of class inclusion. These syllogisms used propositions containing subjects and predicates interpreted in terms of classes included within or excluded from each other. In later chapters we shall study the compound types of propositions composed of subpropositions rather than of terms. But before we leave the categorical type of syllogism we must note a special type which relates terms in relations other than that of class inclusion. Such syllogisms and the nature of "relations in general" will be our concern in this section.

Consider the valid syllogism:

A is older than B.
B is older than C.
$\therefore$ A is older than C.

This syllogism cannot be analyzed by the methods we have hitherto employed. If we put each proposition into "class" form, we shall find four terms: "A," "things older than B," "B," and "things older than C." But the argument is valid, and we must now inquire into the rationale of arguments such as these.

Subject-predicate categorical propositions relate terms to each other, but in a very special way, by class inclusion. Hitherto we have translated all possible relations between terms into the relation of class inclusion. But this procedure, though satisfactory in a great many cases, is not adequate for arguments such as the one above, and it thus becomes necessary to find a more flexible tool for handling other types of relations. In order to do this we must generalize the notion of "relations" and find a wider principle which will cover both the relation of class inclusion and other types of relations.

When we assert "A < B" we are saying that A is *related* to B in terms of class inclusion. We shall now use the symbol "(R)" for "related to," and we shall revise the previous symbolization to "A $(R_<)$B." We may now assert new types of relations in the same manner. If we wish to say that A is older than B, we need not use the relation of class inclusion. We may use "o" for the relation of "older than" and symbolize the relationship as "A (R_o)B." This means that A is related to B in the relation of "older than." Similarly with other types of relations. The syllogism above may thus be symbolized as follows:

A (R_o)B.
B (R_o)C.
$\therefore$ A (R_o)C.

This type of argument may also be diagrammed, but not by circles. We may use a straight line to represent the different points on a line representing ages from zero (0) to infinity (n), and we may then indicate the position of each term on the line, thus:

0 ______ C ___ B ___ A ______ n

The diagram shows us that if A is older than B and if B is older than C, then A must older than C. This is not startling new knowledge, but it serves as a simple illustration of the manner in which we may picture relations other than class inclusion, in order to test the validity of arguments in which they are used.

It should be obvious that some relations will permit valid argument and that others will not. Thus, if we know that A is the lover of B, and that B is the lover of C, we can conclude nothing with respect to the relations between A and C, nor indeed can we conclude that B is the lover of A. The relation of "lover of" does not permit such inferences. This makes it necessary to classify all relations, so that we may know which types of relations will yield valid inferences, and which will not. The relation of class inclusion, as we well know, is a type of relation which permits valid inferences. We shall now examine the special characteristics possessed by a relation which make such inferences permissible.

We shall classify relations under two general heads, *symmetry* and *transitivity,* each of which has three subdivisions.

1. Symmetry

The three subdivisions are *symmetrical, asymmetrical* and *non-symmetrical.*

a. *Symmetrical relations:*
This type of relation is defined as a relation such that if A has it to B, then B *must have* it to A. Examples: equal to, unequal to, different from, cousin of, playing cards with, etc. In each case if A has the relation to B, then B has it to A.

b. *Asymmetrical relations:*
Here, if A has the relation to B, then B *cannot* have it to A. Examples: father of, older than, greater than, son of, at left of,

etc. In each case if A has the relation to B, then B cannot have it to A.

C. Non-symmetrical relations:
Here, if A has the relation to B, then B *may* or may not have it to A. Examples: Lover of, helper of. If A is the lover of B, B may or may not be the lover of A.

2. Transitivity.
The subdivisions are similar: ***transitive*, *atransitive*, *non-transitive*.**

a. Transitive relations:
This relations is defined as a relation such that if A has it to B and B has it to C, then A *must* have it to C. The relation of "being older than" is such a relation, as are: equal to, ancestor of, class inclusion, etc.

b. Atransitive relations:
Here, if A has the relation to B and B has it to C, then A *cannot* have it to C. Examples are: father of, greater by half, etc.

c. Non-transitive relations:
Here, if A has it to B and B has it to C, then A *may* or may not have it to C. Examples are: lover of, unequal to.

These relations may also be combined as follows:
1. Transitive-symmetrical: equal to, contemporary of
2. Transitive-asymmetrical: greater than
3. Transitive-non-symmetrical: included in the class of
4. Atransitive-symmetrical: spouse of
5. Atransitive-asymmetrical: father of
6. Atransitive-non-symmetrical: nearest blood relative of
7. Non-transitive-symmetrical: cousin of
8. Non-transitive-asymmetrical: unrequited lover of
9. Non-transitive-non-symmetrical: lover of

We shall now consider the importance of these relations with respect to some inferences. "$A < B$, and $B < C$; therefore, $A < C$" is a valid inference because class-inclusion is a transitive relation.* "Older than" is also a transitive relation, and permits us to draw a similar type of inference. In other words, it is our knowledge that relations such as "class-inclusion" and "older than" are transitive relations which justifies us in drawing certain inferences.

We may now generalize the reasoning involved in the sorites. The Aristotelian sorites is a series of terms related by the transitive relation of class-inclusion. Thus if $A<B$, $B<C$, $C<D$, $D<E$, then $A<E$. For purposes of fur-

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*Note, however, that this inference will hold only for general universals and not for singular propositions, since class-*membership*, as distinguished from class-*inclusion*, is an atransitive relation. Where singular propositions are used in a syllogism, as in the familiar, "All men are mortal, Socrates is a man, etc.," the inference rests on the principles that if every member of class A is a member of class B, then any specified member of the first class must be a member of the second class.

ther simplification, this series of propositions may be stated as $A<B<B<D<E$. Such a series is called a "chain of relations," and indicates that any term at the left will be included within any term at its right, since "<" is a transitive relation. In interpreting such a chain, however, we should remember that it is a simplification of a sorites, with the connecting links omitted. In *reading* it, we must supply the missing links, viz.: "A is in B, and B is in C, and C is in D, and D is in E."

We may also generalize our previous analysis of the relation of conversion. We found that the E- and I-forms were convertible. In our new language, we may say that the relations of "being wholly excluded from" and "being partially included within" are symmetrical relations, so that if A has one of these relations to B, then B must have it to A. But the A-form relation of "being wholly included within" is a non-symmetrical relation, and from this it follows that the A-form is not convertible simply. The generalization of relations also permits conversions which would not be permissible under class relations. Thus "married to" is a symmetrical relation, and symmetrical relations are always convertible. If "A is married to B," we may thus convert into "B is married to A." If we interpreted the original statement in class terms, its meaning would be substantially altered and its conversion preposterous. We may also now employ a new form of conversion, called "conversion by converse relation," when the relation is asymmetrical. Thus, "B is greater than A" converts by converse relations into "A is smaller than B." Similarly with "A is west of B" and "B is east of A."

We shall not further applications of these relations as we proceed. In particular, the importance of the transitive relation of "implication" will be emphasized. This relation, the most important relation in inference, will be discussed in the next chapter.

Exercises

A. Classify each of the following relations with respect to symmetry and transitivity:
   1. A is beating B.
   2. A is taller than B.
   3. A is a sister of B.
   4. A is the best friend of B.
   5. A is outside of B.
   6. A is "breathing down the neck of" B.

B. Which of the following inferences are valid? Explain why, in terms of the relations involved.
   1. A is the employer of B, and B is the employer of C. So A is the employer of C.
   2. A is heavier than B, so B is lighter than A.
   3. A is the twin of B, so B is the twin of A.
   4. A is a member of the Chicago Chamber of Commerce, and the Chicago Chamber of Commerce is a member of the United States Chamber of Commerce, so A is a member of the United States Chamber of Commerce.

CHAPTER 11

The Relations Among Propositions

Section I: Relations with Respect to Truth and Falsity

This chapter is a kind of interlude in our general analysis of syllogistic forms. We shall continue our discussion of relations, but our interest will now shift from the relations of *terms* to the relations of *propositions*. We shall examine the relations of propositions with respect to their truth values. Our fundamental problem will be this: given a pair of propositions, under what conditions does the truth or falsity of one proposition determine the truth or falsity of the other? As an example of this kind of problem, consider the following propositions, designated by the letters "P" and "Q":

P: All nummulites are foraminifers.
Q: No nummulites are foraminifers.

These propositions refer to actually existing things, but let us assume that the reader knows nothing concerning truth or falsity of either P or Q. We may, nevertheless, discuss the relations of these propositions with respect to their truth values. Suppose we *assume* that one of these propositions is true. We can then draw inferences concerning the truth or falsity of the other. For example, if P were true, is it possible that Q might also be true? Obviously not. If P were true, Q would necessarily be false. P and Q cannot both be true. But both could be false, since they do not exhaust all the possibilities. *Some* nummulites might be foraminifers and some might not be. If the last situation prevails, then both P and Q would be false.

We see, then, that it is possible to discuss the truth relations of propositions even though we do not know which, if either, is true. Our problem is to determine how the truth or falsity of one proposition affects the truth or falsity of another. Consider another example. Our friends Bill and Jim are arguing once again:

Bill: No union has ever been justified in calling a strike.
Jim: No union has ever called an unjustified strike.

Bill and Jim, we note, are extremists. We know that both are wrong, since some strikes are justified and others are not. But in considering the logical relations of these propositions to each other, we must disregard our "outside" knowledge, in the sense that we may happen to *know* that a proposition is true (or false). We must consider only the truth values of the propositions to each other. We must ask, Does the truth of one of these propositions necessitate the truth of the other? Could both be true? Could both be false? The answers to these questions in the pair of propositions asserted by Bill and Jim will be exactly the same as in P and Q above, since the two pairs of propositions illustrate exactly the same relations.

Would the reader say that Jim *contradicted* Bill's statement in our example? If so, then the reader would be mistaken, for the logician defines "contradiction" as a relation such that, if one proposition of a pair is true, then the other must be false, and if one of the pair is false, then the other must be true. This is not the relation which holds in the two pairs of propositions we have examined. The relation holding between P and Q in these pairs of propositions is called "contrariety."

Let us now consider a pair of contradictory statements:
P: The first atomic bomb exploded on July 16, 1945.
Q: The first atomic bomb did not explode on July 16, 1945.

Once again we note that we must disregard the fact that we know that one of these statements happens to be true. Our logical questions are: Would the truth of P necessitate the falsity of Q? If P were false would Q necessarily be true? When the answers to both of these questions is Yes, then the relation between the pair of propositions under consideration is called "contradiction."

One more illustration of a logical relation:
P: Nero was not the most cruel of all the Roman emperors.
Q: Commodus was not the most cruel of all the Roman emperors.

Here we have a new kind of relationship between P and Q. Both of these statements may be true. Neither Nero nor Commodus may have been the most cruel of all the emperors. If P is assumed to be true, then Q may or may not be true, and similarly, if Q is assumed to be true, then P may or may not be true. But now note what may not be so obvious, that P and Q could not both be false. If P is false, then Q would necessarily be true; if Q were false, P would necessarily be true. For consider: If P were false, then it would follow that Nero was the most cruel emperor. Since only one individual can be entitled to this distinction, Q, which says Commodus was not the most cruel, would then necessarily be true. When propositions are related in this manner, the relation is called "subcontrariety."

We shall consider seven relations in all: independence, equivalence, contradiction, contrariety, subcontrariety, superimplication, and subimplication. These seven relations are all the possible relations which two propositions may hold to each other in terms of truth and falsity. We shall now analyze each type of relation in detail.

Section II: The Seven Relations

Relation 1. Independence

The relation of "independence" means that two propositions have no bearing upon each other in terms of their truth or falsity. For example, P: "Shakespeare wrote Hamlet" is logically independent of Q: "Betelgeuse has a diameter approximately 300 times that of the sun." Though both of these propositions happen to be true, the truth or falsity of either determines nothing concerning the truth or falsity of the other. Their truth values are thus wholly irrelevant with respect to each other. Consider another pair: P: "Most children go to public schools" and Q: "Most children prefer to go to public schools." These are also independent, since from the truth or falsity of one of these propositions we could not necessarily conclude that the other is either true or false. As noted earlier we must disregard the actual truth or falsity of the propositions.

We shall define each type of relation by a table of "truth-values." The table for independence is as follows:

P true......Q ?
P false.....Q ?

The question mark means "undetermined," i.e., we cannot know whether the proposition at the right side of the table is either true or false. Read as follows: If P is true, then the truth or falsity of Q is undetermined. Similarly for "P false." When propositions are independent, then both may be true, both may be false, or one may be true and one false. The truth or falsity of one has no bearing on the truth or falsity of the other.*

Relation 2. Equivalence

We have already learned the meaning of equivalences in propositions. We shall now define this relation: Two propositions are logically equivalent when the truth of one requires the truth of the other, and when the falsity of one requires the falsity of the other. In symbols:

P true......Q true
P false.....Q false

Two equivalent propositions will always be true together, and false together.

Relation 3. Contradiction

The logician defines contradiction in a precise manner. One proposition is the contradictory of another when the truth of one involves the falsity of the other and when its falsity involves the truth of the other. Both cannot be true and both cannot be false. The propositions P: "The Golden Plovers are noted for their gregarious habits," and Q: "Golden Plovers are not noted for their gregarious habits," fulfill the definition, and are thus contradictories. In symbols:

P true......Q false
P false.....Q true

Both cannot be true; both cannot be false.

P: "All women are fickle," is the contradictory of Q: "Some women are not fickle." If P is true, then Q must be false. If P is false, then it must be the case that at least some women are not fickle, i.e., Q will be true. Note

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*This means that independence is a symmetrical relation, as are equivalence, contradiction, contrariety and subcontrariety. Q's relationship to P is the same as P's relationship to Q. Implication, however, is not a symmetrical relation.

also the symmetricality of the relation: If Q is true, then P must be false, and if Q is false, then P must be true.

Relation 4. Contrariety

This relation must be carefully distinguished from contradiction. P: "All women are fickle," and Q: "No women are fickle," are *not* contradictories, since both might be false. (Both *are* false, but we must ignore outside knowledge in considering the manner in which two propositions are related; it is sufficient to know that both *can* be false.) But note that if P were true, then Q would necessarily be false, and vice versa. P and Q are contraries. One proposition is the contrary of another when they are so related that both cannot be true, but both can be false. In symbols:

P true......Q false
P false.....Q ?

Both can be false; both cannot be true.

The propositions P: "Washington was our greatest president" and Q: "Lincoln was our greatest president" are contraries. Both could not be true, but both might be false. Jefferson or some other president might have been our greatest president. If one of this pair of propositions is true, the other is false, but if one is false, the truth of the other remains undetermined.

Contraries, it may be noted, do not exhaust all possible alternatives, whereas contradictories do. The contradictory of P in the last paragraph would be, "Washington was *not* our greatest president.

Relation 5. Subcontrariety

Consider the following propositions: P: "Some people in the United States are eight feet tall" and Q: "Some people in the United States are not eight feet tall." Let us examine these propositions in the light of the relations we have studied thus far. The propositions are obviously not equivalent. Are they contradictories? No, because both might be true. It follows also that they cannot be contraries, since two contraries cannot both be true. What precisely is their relationship?*

Both can be true but both cannot be false. Consider: If P were *false*, we would then have to say that there were no people in the United States who were eight feet tall. If there are no such people, it follows that Q must be true. (On the other hand, if Q were false, it would follow that P was true.) When propositions have this type of relationship, they are called subcontraries. In symbols:

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*Propositions should be called independent only as a last resort, when careful study indicates that none of the seven logical relations are applicable.

P true......Q ?
P false.....Q true

Both may be true, but both cannot be false.

Note again that "some are" and "some are not" are interpreted strictly by logicians.* "Some are" means "and possibly all." "Some are not" means "and possibly none." If P is true, i.e., if some people *are* eight feet tall, we cannot conclude that some *are not*. The truth of P allows the possibility that some are not, but does not guarantee it. Similarly, if Q is true, i.e., if some people *are not* eight feet tall, we cannot conclude that some *are*. The truth of either proposition leaves it an open question as to whether or not the other is true.

The relation of subcontrariety should be carefully compared with and distinguished from contrariety. In the former both propositions can be true; in the latter both can be false. In subcontraries the truth of one proposition leaves the other undetermined; in contrariety the falsity of one leaves the other undetermined. In subcontraries the falsity of one proposition involves the truth of the other. In contraries the truth of one involves the falsity of the other.

The following example of subcontrariety resembles the Nero and Commodus example above:

P: Carnera is not the worst heavyweight fighter of all time.
Q: King Levinsky is not the worst heavyweight fighter of all time.

The reader will find the definition applicable to this example. If it is false to say that Carnera *is not* the worst, then he *is* the worst. Q must then be true.

Relation 6. Superimplication

Consider the relations of the following:

P: All contemporary French novelists are Existentialists.
Q: Some contemporary French novelists are Existentialists.

If P is true, then Q must be true. If P is false, Q is undetermined. For if it is the case that "all" of a group have a certain characteristic, then surely "some" must have that characteristic. But if we merely know that it is false to say that "all" have it, then "some" *may* have it or "none" *may* have it. In other words, the falsity of the "all" leaves the truth of the "some" undetermined. In symbols:

P true......Q true
P false.....Q ?

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*Previously discussed under the I-form and O-form in Section V of Chapter 8.

When two propositions are related in accordance with our table, the relation is that of superimplication. The reader should note that superimplication is not a symmetrical relation, as were the first five. If P is the superimplicant of Q, Q is *not* the superimplicant of P. In order to see the truth values from the "Q" point of view we must turn to the next relation, "subimplication," also an asymmetrical relation.

Relation 7. Subimplication

P: Some contemporary French novelists are Existentialists.
Q: All contemporary French novelists are Existentialists.

Note that this is a new relation, so that the "Q" sentence in the former relation is now called "P," and vice versa. In this new relation, if P is true, Q is undetermined, but if P is false, Q must be false. In symbols:

P true......Q ?
P false.....Q false

If we know that "some" of a class have a certain characteristic, then "all" may or may not have it. But if even "some" do not have it, it is impossible that "all" should have it.

Superimplication and subimplication are correlative aspects of the basic relation called "implication."

When one proposition *implies* another, the first (the implicans, or "implying proposition") is *superimplicant* to the second (the implicate, or implied proposition), and the second proposition is *subimplicant* to the first. When one proposition implies another, the four statements in the following tetrad will hold:

(1) If the superimplicant is true, then the subimplicant must be true.
(2) If the superimplicant is false, then the subimplicant may be true or false.
(3) If the subimplicant is true, then the superimplicant may be true or false.
(4) If the subimplicant is false, then the superimplicant must be false.

The first two lines of the tetrad give us the truth values when we take the implicans as primary; the last two lines when the implicate is taken as primary.

An interesting example of the implicative relationship will be found in:

P: All Eskimos have blue eyes.
Q: No Eskimos have brown eyes.

Assuming that eyes can have only one color, then, if P is true, Q must be true, but if P is false, the truth or falsity of Q is undetermined. P is thus the superimplicant of Q since it fulfills the requirements of the definition. We may then look at the situation from the Q point of view, and we shall find that if Q is true, P is undetermined, but that if Q is false, then P must be false. Q is thus the subimplicant of P. This will become clear if you think about it for a while. If you don't see it, come back to it later.

In closing this discussion, we note that the relation of superimplication is the fundamental relation in the syllogism. Thus:

P: All lemurs are mammals, and this animal is a lemur.
Q: This animal is a mammal.

P is a compound proposition made up of two propositions, each of which might be the premise of a syllogism, and Q represents the conclusion of that syllogism. P implies Q, so that if P is true, Q must be true. The syllogism is valid. But if either or both of the premises were false, Q might or might not be true. Thus we have P true, Q true; P false, Q? This is the relation of superimplication.

Exercises

Write out the tables of truth values for the seven relations and keep the list before you. Identify the relations in the following pairs of propositions. Ask the following questions in each case: If P is true, is Q true, false or doubtful? If P is false..., etc.

1. P: Cleveland defeated Blaine in the presidential election of 1888.
   Q: Cleveland did not defeat Blaine in the presidential election of 1888.
2. P: Blaine was the Republican candidate in 1892.
   Q: Harrison was the Republican candidate in 1892.
3. P: No Polynesians east cocoanuts.
   Q: All Polynesians eat cocoanuts.
4. P: No Eskimos eat blubber.
   Q: Some Eskimos eat blubber.
5. P: The Fifth is Beethoven's best symphony.
   Q: The Sixth is Beethoven's best symphony.
6. P: The Fifth is not Beethoven's best symphony.
   Q: The Sixth is not Beethoven's best symphony.
7. P: There is a book in this library which contains subversive ideas.
   Q: There is a book in this library which contains no subversive ideas.
8. P: All Eskimos live in snow houses.
   Q: Some Eskimos do not live in snow houses.
9. P: An atomic war will destroy mankind.
   Q: Human beings ought to abolish atomic warfare.
10. P: Swing music is first rate music.
    Q: Swing music is fourth rate music.
11. P: Some politicians are statesmen.
    Q: All politicians are statesmen.
12. P: Some of these exercises are easy.
    Q: Some of these exercises are not easy.
13. P: X is an artichoke.
    Q: X is a vegetable.

14. P: This book is not written in Chinese.
Q: This book is not written in Japanese.
15. P: All Indians have blue eyes.
Q: No Indians have green eyes.

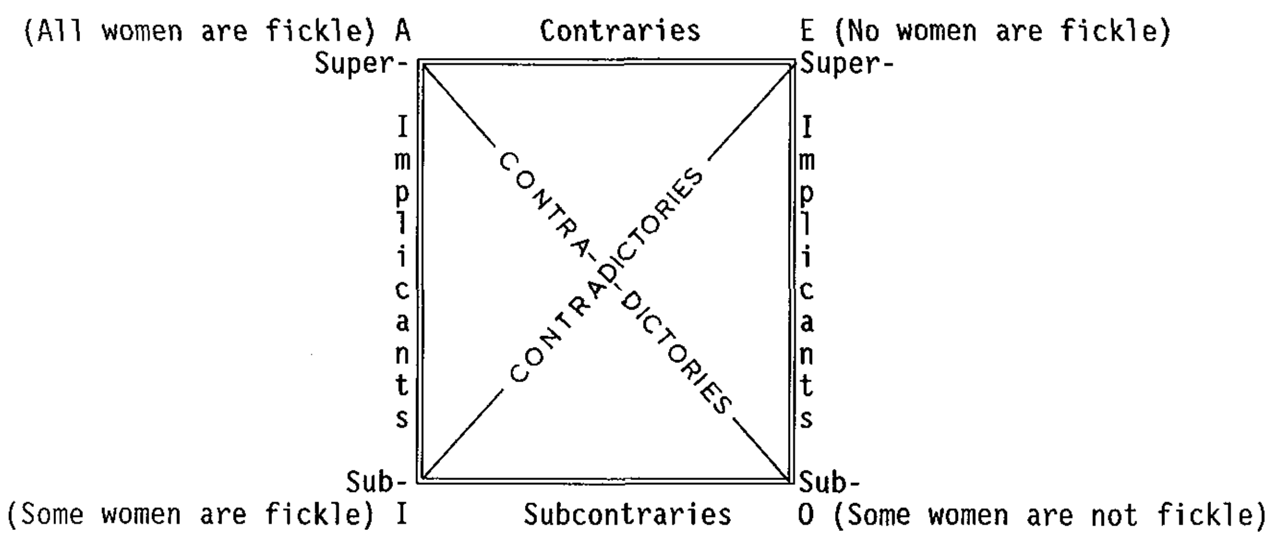
Section III: The Square of Opposition

The term "opposition," as used in traditional logic, refers to the relations of propositions having the same subjects and predicates but differing in quality or quantity or both. The A-E-I-O forms may thus be "opposed" to each other when they embody the same subjects and predicates. We shall use the following group for illustrative purposes:

A: All women are fickle.
E: No women are fickle.
I: Some women are fickle.
O: Some women are not fickle.

No two of these propositions are independent of each other, since the truth or falsity of any one will involve truth values in the others. Nor are any two equivalent. But we shall find the other five relations exhibited among them. Thus, the A- and O-forms are contradictories, since their relation to each other fulfills the definition of contradiction which we stated earlier, namely, that if the truth of one of a pair of propositions involves the falsity of the other, and the falsity of one involves the truth of the other, then the relation is that of contradiction. E and I are also contradictories. A and E are contraries, since both cannot be true, though both can be false. I and O are subcontraries since both could be true, but both could not be false. A is the superimplicant of I, and E of O. I and O are the subimplicants of A and E respectively.

The traditional logicians worked out an ingenious diagram called the "Square of Opposition," which embodies these oppositions, viz.:



This diagram requires a word of explanation. The letters A-E-I-O at the corners stand for the propositions in the brackets, all of which have the same subject and predicates. The diagonal lines connecting A and O, and E and I, marked "contradictories" mean that A-O and E-I are pairs of contradictories. The top line connecting A and E indicates that these are contraries, and the line between I and O that these are subcontraries. The vertical lines are marked "implicants," and the notations "super" and "sub" indicate that A is the superimplicant of I (E of O) and that I is the subimplicant of A (and O of E).

This diagram gives us an automatic device for detecting the relations of propositions *when they have the same subjects and predicates.* This limitation is very important for, as we already know, we may determine the relations between propositions which do *not* have the same subjects and predicates, as in relating "John is six feet tall" to "John is six feet, one inch tall." The relations of such pairs of propositions cannot be determined by the Square, for their predicates differ. But we know that they are contraries since they fulfill the definition of contrariety. The Square, then, does *not define*, but merely *illustrates* a limited application of the five relations.

The Square also has certain internal limitations. The universal propositions must be general, not singular, for singular propositions have no subimplicants. Furthermore, when we oppose singular A and E propositions to each other we find that the distinction between contradiction and contrariety disappears, as in "John is a great golfer" and "John is not a great golfer." Other limitations, based upon the re-interpretation of the meaning of universal and particular propositions, will be discussed in the next section.

Despite these limitations, however, the Square is useful for the purpose for which it was devised. It is also an interesting schematic exhibition of the five relations with respect to the A-E-I-O forms. When usable, it will be found very convenient for reference.

Exercises

The Square of Opposition should be used in working out these exercises.

A. Identify the relations among the following pairs:

1. P: Some women are not aviators.
   Q: Some women are aviators.
2. P: Some novelists are amoralists.
   Q: All novelists are amoralists.
3. P: Some politicians are crooks.
   Q: No politicians are crooks.
4. P: Some exercises in logic are not easy.
   Q: All exercises in logic are easy.
5. P: No Southern senators are Republicans.
   Q: Some Southern senators are not Republicans.
6. P: No Germans are pacifists.
   Q: All Germans are pacifists.

B. Complete the following chart, using T, F, and ? to symbolize True, False, and Doubtful. For example, if A is true, then its contradictory, O, must be false; its subimplicant, I, must be true; and its contrary, E, must be false.

If A is true, then I is _____, E is ____, O is ____.
A is false, then I is ____, E is ____, O is ____.
If I is true, then A is _____, E is ____, O is ____.
I is false, then A is ____, E is ____, O is ____.
If E is true, then A is _____, I is ____, O is ____.
E is false, then A is ____, I is ____, O is ____.
If O is true, then A is _____, E is ____, I is ____.
O is false, then A is ____, E is ____, I is ____.

C. The propositions in the following group are stated in irregular language. In order to place them on the Square, translations into the A-E-I-O forms are necessary. In some cases it may be necessary to obvert or convert them in order to obtain two propositions with the same subjects and predicates. Identify the relations after you have disposed of the linguistic problems.

1. P: Only the brave deserve the fair.
   Q: Some persons who deserve the fair are not brave.
2. P: None but geniuses write like that.
   Q: All persons who write like that are not geniuses.
3. P: Nothing difficult displeases me.
   Q: Some things which displease me are not difficult.
4. P: All men like jokes.
   Q: No persons who like jokes are men.
5. P: Some novelists are moralists.
   Q: Some novelists are amoralists.
6. P: Only the brave deserve the fair.
   Q: None of the brave deserve the fair.

D. Which problems on pages 98-99 could have been answered by reference to the Square?

E. Prove by using the relations of contradiction and contrariety that I and O cannot both be false, and that the falsity of I requires the falsity of A.

F. Criticize the following:
1. Granted that it is true that All wise men are mortal,
2. then No wise men are immortal
3. and No immortal beings are wise men.
4. Hence it is false that Some immortal beings are wise men,
5. and that Some immortal beings are not unwise men. But if this is false, it must be true that
6. All immortal beings are unwise men.
7. And that Some unwise men are immortal beings.

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(Hint: Are the terms properly negated, in the strict sense of contradiction?)

Section IV: The Existential Import of Categorical Propositions

Throughout our discussions of categorical propositions we have been making an unstated assumption concerning the existential import of propositions. We have assumed the existence of members of the classes referred to by such propositions. This assumption must now be made explicit for two reasons: (1) The careful thinker should be aware of the assumptions on which the validity of his reasoning depends, and (2) modern symbolic logic has shown us that the rules of inference of traditional logic sometimes depend upon certain unstated assumptions and that the possibilities of valid inference are different if we use a different set of assumptions. This matter deserves some attention.

In the classical logic the problem of "existential import" was never raised. In modern symbolic logic, however, the universal propositions (A and E) are interpreted as not asserting the existence of members of the class denoted by the subject term. Only particular propositions (I and O) assert existence. Following this re-interpretation of the existential import of the categorical propositions, we get new definitions of the A-E-I-O forms, viz.:

A: For any x, if x is an S then x is a P.
E: For any x, if x is an S then x is not a P.
I: There is an x such that x is an S and x is a P.
O: There is an x such that x is an S and x is not a P.

Note that the universals, in this interpretation, make no assertions that any S's exist. Take an A-form: "All margays are wild." In symbolic logic this is interpreted to mean that if anything is a margay then it is wild. Similarly, "No margays are wild" is interpreted to mean "If anything is a margay then it is not wild." The I-form, however, (Some margays are wild) does assert that there are margays: "There is an x such that x is a margay and x is wild" and similarly in the O-form.

Before we attempt to justify this new interpretation of the meaning of the A-E-I-O forms let us examine one of the consequences which follows from these definitions. It will now be illegitimate (without additional assumptions, to be examined presently) to deduce the truth of an I-form from the truth of an A-form (the relation of superimplication). Why is this? Examine the definitions of the A and I above. The A says that *if* anything is an S, then it is a P. The I: there is an x such that...In other words, we cannot derive an assertion concerning existence from a non-existential statement.

This point needs further clarification. We have heretofore assumed that "Some women are fickle" follows from "All women are fickle," but we are now told that this is an illegitimate inference. Nevertheless, the difficulty can be easily remedied if we recognize that the usual assertion that "All women are fickle" carries with it the tacit *assumption* that women exist. What we really mean, then, in making such an assertion, is something like the following: "If x is a woman, then x is fickle, and we assume that women exist" (or "If x is S then x is P, and assume that there are S's.") We can now infer that there *is* an x which is an S and a P, since there are S's and all S's are P's. Once we make the assumption of existence explicit, as an additional premise, the I follows from the A, as in the classical treatment of this matter. The importance of the new convention, then, is that we should be aware of the fact that we *have* made this assumption.

Let us now examine the justification for the new convention that universals should not be interpreted in an existential manner. Modern logic adopts this convention because of the undoubted fact that universals frequently refer to non-existential classes. As an example, examine the following A-form: "All world governments will bring more evil than good." We definitely do not mean that world governments exist, so that the interpretation "If there were a world government, then it would bring more evil than good" renders our meaning more accurately. Similarly many significant universals in the physical sciences must be interpreted in a non-existential manner, as Newton's first law of motion ("All bodies free of impressed forces will persevere in their states of rest or motion in a straight line forever"), for there are no bodies free of impressed forces.

It is thus apparent that some universals do not assert existence. Since it is desirable to have a uniform rule which will apply in all cases and since it is preferable to follow a strict interpretation which assumes as little as possible, modern logic interprets all universals as non-existential and supplements with the assumption of existence, when this is a appropriate. In practice, of course, many universals are meant in an existential sense, and it is unnecessary to make this assumption explicit in everyday argument, but the point is that we should know what we are doing and not draw inferences concerning existing things when this is impermissible.

It may interest the reader to note some further consequences of the new conventions with respect to some previous inferences. The conversion by limitation of an A-form will be incorrect without the explicit assumption of existence. Similarly, it will be illegitimate to deduce a particular from two universal premises, as in the following example:

No world governments are perfect organizations.
All world governments are organizations which abolish national sovereignty.
∴ Some organizations which abolish national sovereignty are not perfect organizations.

This syllogism is invalid if we adopt the convention that particulars affirm existence, whereas universals do not. We have hitherto assumed that this would be a valid argument.

Another very important consequence of the new convention is the radically different interpretation of the Square of Opposition which is now required. I and O can no longer be derived from A and E, for reasons already noted. A and E are not necessarily contraries, nor are I and O necessarily subcontraries, since both of the former pair might be true, and both of the latter false. This somewhat startling consequence follows from the new assumptions. Take the I and O propositions: "Some ghosts are in this room" and "Some ghosts are not in this room." Each of these is regarded as false, on the ground that these particulars assert that ghosts actually exist, and this is a false assertion. The I-form asserts "There is a ghost in this room," and the O: "There is a ghost which is not in this room." Since both are false, their contradictories, A and E, must both be true. It thus follows that "All ghosts are in this room" and "No ghosts are in this room" are both *true*. For if we grant that there are no such things as ghosts, we will also grant that all of them are in this room, i.e., "all of them that there are" are in this room, namely, none. And we will also grant that none of them are in this room. Thus, under the new existential interpretation, both an I and an O with the same subjects and predicates may be false, and the corresponding A and E true.

But these difficulties do not arise when we assume the existence of the subjects of universal premises, as is the rule in the traditional logic. And this brings us to the very important problem of understanding what is meant by "existence." Both the classical and modern logic use the concept of "universes of discourse." This means that by "existence," in some cases, we may mean existence in the actual world of space and time. In other cases a special kind of "existence" is referred to, i.e., membership in a "universe of discourse" other than the real one. Thus a novelist or dramatist may create a world of his own in which his characters enjoy a special kind of being, and the same holds for the creatures of myths. We argue about the character of Hamlet, we say that it is correct to define a mermaid as "half woman, half fish," and when we say "Some fairies are wicked creatures," we definitely do not mean to affirm existence in the real world (though the proposition is particular), but we do affirm existence of a special sort for the denizens of the Grimm fairyland.

In other words, though particulars assert existence and universals do not, we must also be careful to specify the kind of existence referred to. Both "Some Greek gods were lustful" and "Some Greek gods were not lustful," when interpreted in terms of the universe of discourse of the Greek mythology, cannot both be false, just as in the universe of discourse of a ghost story our earlier I- and O-forms could not both be false. In such universes, the corresponding A- and E-forms could not both be true. (Nor can they both be true when we deal with actual existents.) On the other hand, "All angels are immortal beings" makes no assertion concerning existence, even in the universe of discourse of angelology, for it is a universal proposition. From such a universal we could not infer that "Some angels are immortal beings" unless we explicitly assume that angels do exist in that universe. If we make this assumption, then the inference would be justified.

Section V: The Traditional "Laws of Thought"

Traditionally, the so-called "Aristotelian Laws of Thought" have been regarded as basic in all reasoning. These laws have been formulated in two different ways, for things (or classes), or for propositions, as follows:

1. The Law of Identity: For things, the law asserts that "A is A," or "anything is itself." For propositions: "If a proposition is true, then it is true.
2. The Law of Excluded Middle: For things: "Anything is either A or not-A." For propositions: "A proposition, such as P, is either true or false."
3. The Law of Contradiction: For things: "Nothing can be both A and not-A."

For propositions: "A proposition, P, cannot be both true and false."

These laws, though not the only principles used in reasoning, are certainly basic in the sense that all reasoning presupposes them. These laws, of course, are really axioms, not psychological laws which purport to tell us how we actually think. They are not scientific laws of nature, for they are not descriptions of observed uniformities of behavior. These laws can also be violated as when people contradict themselves, or are inconsistent. When we think rationally, however, we always assume these axioms. We shall discuss their meaning and significance in connection with certain popular criticisms and misunderstandings.

1. The Law of Identity

For things. The law "for things" is used in widely different ways. As a logical relation identity is illustrated by equations such as $x=x$, or $x + 2x = 3x$, or statements such as "Mark Twain is Sam Clemens." The "is" here means that each name denotes the same individual.

When we say "Tables are tables" and "Cows are cows," we use the law as a principle of semantics. Unless terms retain identical meanings throughout a given unit of discourse and have fixed referents in their various occurrences, communication would be impossible.

In metaphysics the principle of identity is often interpreted to mean that permanence as well as change is a pervasive feature of reality. We shall expand on these usages in answering some criticisms of the law.

Some writers, in particular the late Count Alfred Korzybski and the General Semanticists, have attacked the law as false. Korzybski criticized the use of the "is" of identity, claiming that, it results in such expressions as "Grass is green" or "Smith is a man" which are taken to mean that grass is identical with green or that the *name* Smith is identical with a man! The word, he tells us, is not the thing. This is all very true and instructive. It is an error, for example, to take the word "freedom" as a guarantee of a free society, but this is not a criticism of the law of identity but of foolish misapplication of the law. In any case it may be doubted whether the error he notes is actually responsible, as he claims, for his catalogue of the ills to which the spirit and flesh of modern man are heir, ills such as:

> ...unrest, unhappiness, nervous strain, irritability, lack of wisdom, and absence of balance, the instability of our institutions, the wars and revolutions, the increase of "mental" ills, prostitution, criminality, commercialism as a creed, the inadequate standards of education, the low professional standards of lawyers, priests, politicians, physicians, teachers, parents, and even scientists...

Because of his belief that the Law of Identity is responsible for these evils, Korzybski believed that the crucial need of the twentieth century is the formulation of a new non-Aristotelian logic which will reject the Law of Identity.

Korzybski's basic criticism of the Law of Identity is that it is not true for a world that is in constant change. Things are in constant flux, he argues, so that nothing is ever the same from moment to moment. When we say that "a table is a table," we ignore the fact that the table *now* is different from what it was a moment ago. Hayakawa, in his *Language in Action*, as we noted in our earlier discussion of extension and intension, follows Korzybski's lead here. He asserts that "no word can ever have the same meaning twice" on the ground that the thing referred to has changed in the meanwhile and that out attitude toward it has also changed. Two answers may be given to this criticism:

(1) "The table *now* is different from what it was a moment ago." True, but unless words consistently referred to the same referent throughout a given unit of discourse, communication would break down. When one speaks of a table, he means a table, and is understood to mean a table, for anything is itself and not some other thing.

(2) The critics also confuse logical and physical identity. The problem here becomes a metaphysical one, involving the basic concepts of permanence and change. In the ancient world, the Greek philosophers first formulated this problem. Heraclitus, the philosopher of change, asserted that it was impossible for anyone to step into the same river twice, since the river was constantly changing. But Plato and Aristotle effectively criticized this doctrine of universal "flux" by noting that the statement "X has changed" requires that X retain its identity throughout the series of changes, for otherwise it would be impossible to say that X had changed. There is constant physical change in our universe, but also permanence or identity. The reader is undoubtedly a somewhat different person now from what he was before he began to read this discussion, but he must also be the same reader who began to read, for otherwise how could we say that *he* had changed? There can be no change except in relation to something that is constant.

For propositions. In the propositional formulation of the law of identity, we say that if a proposition is true, then it is true. This again is not so obvious as it appears, as we shall see when we consider some of the implications of this formulation. Does the reader believe that a proposition can be "true for one man and false for another," or that "what is true in one age of history is false in another age"? If so, he rejects the law of identity, for the law means that if a proposition is true, it is true for *all persons*, in *all times*, and in *all places*. But, the reader may urge, was not the statement "The earth is flat" true in the middle ages and is it not false today? The answer to the first part of this question in No. The earth was not flat in the middle ages, and to have called it such was to utter a false statement. People *believed* that the earth was flat, but believing a thing is so does not make it so. Their belief was false.

Another typical criticism of the law proceeds as follows: May not the time element, or the space element, make a proposition true for one time and place and false for another? For example, "It is cool today" may be true where we are, but false in the tropics, or false for us in July. But "It is cool today" is an unprecise statement of the speaker's meaning. To make it precise we must not only date it and locate it, but we must say something like the following: "The temperature is 41° F. at 1:15 P.M. in the shade at the meteorological station in Chicago, Illinois on March 31, 1960." *If* this statement is true, then it must be true for all time and places.

It is undoubtedly the case that men's beliefs differ, so that what *seems* true to one man will *seem* false to another. Confidence in one's beliefs is not always justified, nor is certainty always a guarantee of truth. We should remember that we may be mistaken in what we believe to be true. Truth is an ideal difficult to achieve, and in practice we may find it safer to say that a given belief appears to be probable in the light of the available evidence, rather than to say, "It is true." But if we know the truth, then we know the truth.

2. The Law of Excluded Middle

For things. Anything is either A or not-A, or anything is either A or its contradictory. We may assert that anything in the universe is either a piece of chalk or not a piece of chalk. A color is either red or not-red. Contradictories always exhaust the universe of discourse to which we refer.

Some critics urge that this is vicious "either-or" thinking, representing a "two-valued orientation" toward the world, whereas the world requires a "multi-valued orientation." There are, it is urged, infinite differences in things, so that it is false to say "Either A or not-A." For example, we should not divide men into two classes, the good and the evil, for there is some evil in the best of us, and some good in the most evil. The cartoonist Mauldin once illustrated the vice to which the critics refer. He pictured one man carrying a sign with the words, "Russia is never wrong," Another carried the sign, "Russia is always wrong." The critics of the law ask: Does not another alternative exist? Must Russia be either always right or always wrong?

These critics call our attention to a prevalent fault in thinking. A great deal of confused thinking falls into an "either-or" pattern. We often assume that there are only two possibilities in a situation or only two choices when there are more than two. We say "Either you are for us or against us" (you may be neutral); we say "Either we must establish a world government or an atomic war is inevitable" (the "cold war" may continue indefinitely). We shall call this "the error of insufficient options." But this type of thinking should not be confused with the law of the excluded middle. The criticism of the law noted above is based upon a confusion between contrariety and contradiction. The law of the excluded middle says that anything is A or its contradictory. Thus, a man is necessarily either rich or not rich, for "rich" and "not rich" are contradictories. But we cannot say that a man must be either rich or poor for these terms are contraries. The law does not require us to say that Russia is always right or always wrong, but only that Russia is either always right or not always right. In any pair of contradictory propositions one must be true and the other false.

Another type of criticism is based upon the alleged inadequacy of the law of the excluded middle in dealing with matters of *degree*. When a physician measures temperature, for example, he does not make his report in terms of hot or cold or even of fever or no-fever, but he states the degree of temperature. Granted, but the law is not a technique of scientific procedure. It is merely an axiom of reason. "Either the body temperature is 98.6^{o} F. or it is not" is an instance of the law. (It is also significant to state whether or not the patient has a fever.)

Another example of the "degree" criticism is found in B.B. Bogoslovsky's *Technique of Controversy* in which he cites the example of a beard in order to expose this alleged weakness of the law. The point is this: suppose we say "Either Smith has a beard or he does not," and Smith is neither beardless nor does he have a full beard. Consider the difficulties. If we agree that 1,000 hairs make a beard and that 100 do not, we will also agree that 999 make a beard and that 101 do not. But is there some point, say 549 hairs, where we can say: This is not a beard but the addition of one hair will make it one? This seems absurd and the critics say that this proves the law inapplicable to things involving degrees. But the absurdity is based on the fact that it has never been important to define a beard precisely. The law of the excluded middle presupposes that our terms have been precisely defined.

Mastery of a college course is also a matter of degree, and so it also seems unrealistic to say "Either John has mastered the course or he has not." But in this case the administration of a grading system requires a precise definition of mastery, given in the minimum passing grade of 60. Fair or unfair, the student whose grade is 60 has "mastered" the course, one with a grade of 59 has not.

For propositions. A proposition is either true or false. "The street has been sprinkled" is either true or false. There is no middle ground between truth and falsity. Now, suppose that only part of the street has been sprinkled. Would it then be *both* true and false to say that the street has been sprinkled since it has been in part and has not been in part? Here again we find the necessity for precision in our statements. When we say "The street has been sprinkled" we usually mean that certain parts of it have been sprinkled. With respect to *these parts* our statement is either true or false. If the statement were interpreted to mean *"All* parts have been sprinkled" then this proposition too is either true or false.

Vagueness in the meaning of our terms is also responsible for the belief that some propositions are neither true nor false. "I am happy" and "We are enjoying prosperity" are examples of propositions which may be regarded as neither completely true nor completely false. But when the words are defined precisely, then, in some determinate respects the propositions will be either true or false. If we cannot define "happiness" or "prosperity," then we are not stating completely meaningful propositions, and truth or falsity apply only to meaningful propositions.

3. The Law of Contradiction

For *things*, nothing can both have and not have a given characteristic in precisely the same respect. This law asserts that nothing can be both A and the contradictory of A. A man cannot be both rich and not-rich at the same time and in the same respect. For *propositions*, we say that no proposition can be both true and false, in the same respects. The law of relativity tells us that an object may be moving for one frame of reference and at rest in another, but for any given frame of reference the object is not both moving and not-moving. It is perhaps needless to note that we are not always able to determine which of two contradictory propositions is true. But one must be true, and one false.

Exercises

A. Analyze and discuss the following items in terms of the preceding discussion:
   1. Every seven years the cells in a human body change completely. How then can a man's debts he held against him for more than seven years, since he is no longer the same man?
   2. Do the following items illustrate the law of identity?
      a. Those were the days when men were men.
      b. Let us call a spade a spade.
   3. What happens when an irresistible force meets an immovable object?
   4. According to the principle of contradiction, "animal" cannot be both vertebrate and invertebrate. But are not some animals vertebrate and others not?
   5. Are the following statements both true and false?
      a. Heavy objects fall at the same speed as light objects.
      b. Water boils at 212^{o} F.
      c. Hamlet was a man.
   6. Does Aristotle use the principle of the excluded middle in the following quotation from his *Physics?:* "As every occurrence must be ascribed either to coincidence or to purpose, if the frequency of heat in the summer cannot be ascribed to coincidence or chance, it must then be ascribed to purpose."
   7. Is the law of the excluded middle applicable to statements such as "John loves Mary"?
   8. Is it necessarily the case that a nation will either win a war or lose it?

B. Study the following quotations and consider their points of agreement or disagreement with the text. Also answer the questions following each.
   1. There is a venerable law of logic called the "law of excluded middle" which states that A is either B or not B. Thus a piece of paper is either white or not white. This is obviously true, and I shall not deny its soundness as a law of pure logic. At the same time, we must notice that the kind of thinking embodied in this law may be dangerous and misleading when applied to a certain very common range of facts...All over human life we find properties which show continuous variation, and (just as in the case of white and black) we find this property obscured by the use of words implying sharp distinctions. "Sane" and "insane"; "good" and "bad"; "intelligent" and "unintelligent"; "proletarian" and "capitalist," are pairs of opposites which show this property of continuous variation...Any argument, therefore, which begins in some such way as follows: "A many must be either sane or insane, and an insane person is absolutely incapable of reasonable thought..." is a

dangerous piece of crooked thinking, since it ignores this fact of continuity. (R. H. Thouless, *How to Think Straight*, Simon and Schuster, 1939, pp. 119, 123.) Question for discussion: Would a law court be guilty of "crooked thinking" if it sought to determine whether a person guilty of homicide was sane or insane?

2. All people tend to think of things in terms of good and bad, black and white, hot and cold, God and Satan, rich and poor, etc...Since this two-valued orientation underlies most of our thinking except in technological matters, the outcome of almost all disagreements is that both sides are pushed to irreconcilable extremes...Illiterates and "uneducated" people are by no means alone in their two-valued orientation; controversialists in intelligent magazines and in learned journals are similarly conditioned. The reader will recall, for example, the situation in which André Gide found himself after the publication of his *Return from the USSR,* in which he had recorded, with an artist's rigid self-honesty, his impressions of the Soviet Union. Thousands of anti-communists clutched him to their bosoms as a brother, while thousands of his ideological allies gnashed their teeth at his "apostasy." For savages, for heresy-hunters like Mrs. Dilling, as well as for ideologically kosher intellectuals whether of the Left or the Right, there is no middle ground between black and white; it is *all* or *none*. This is what is meant, of course, by the "excluded middle" of Aristotelian logic. How far could modern engineering have got if we had thermometers which could give only two readings, "hot" and "cold"...? (S. I. Hayakawa, "The Meaning of Semantics," *New Republic*, Aug.2, 1939.)
   a. Which common error does Hayakawa criticize?
   b. Criticize his formulation of the law of excluded middle.

3. *A is A.*
   The characters of Aphrodite (a sow) *now* are different from those one second earlier or one second later. Not by much, but by enough to destroy the perfection of identity. A rocket is always the same rocket. True for words, but not for that nonverbal event in space-time which blazes in glory and falls a charred stick as we watch it; not for a mushroom full-blown today and underground yesterday; not for a rose, withered now and lovely a week ago; not for an ice cream cone five minutes in the sun;...We have no knowledge of anything in the real world which is not a process, and so continually changing its character, slowly or rapidly as men measure intervals.

   Everything is either A or not-A.
   The law of the excluded middle might read: "Every living thing is either an animal or a plant." It was so employed by biologists for centuries. We still play the game of twenty questions on the animal, vegetable, mineral basis. In recent years a number of organisms have been studied which defy the distinction. A class of living things has been observed whose metabolism under certain conditions follows the classification of "plant," under other conditions that of "animal." Thus Euglena, a little unicellular water organism, becomes green in abundant sunlight and behaves like a "plant." Remove the light, the green color disappears, and Euglena proceeds to digest carbohydrates like an "animal," rather

than synthesizing them like a plant...The law of the excluded middle is an unreliable guide to knowledge. The law of contradiction-Nothing is both A and not-A-is equally unreliable. Euglena is both "plant" and "animal." (Stuart Chase, *The Tyranny of Words*, Harcourt, Brace and Co., pp. 228-30.)
Defend the laws of identity, excluded middle, and contradiction against Chase's criticisms.

4. The Law of Contradiction is afflicted with a similar falsity. It says "nothing can both be and not be." But anything that can change or have a plurality of relations defies it. It can both be and not be with the utmost ease. It is at one time and not at another. Or in one respect, and not in another. Or in one place, and not in another. Or for one purpose, and not for another. Or in one context, and not in another. (F. C. S. Schiller, *Logic in Use*, Harcourt, Brace and Co., p.38.)
Which qualifications are omitted from Schiller's formulations?

5. Life consists before all just in this, that a living creature is at each moment itself and yet something else. Life is therefore also a contradiction present in things and processes, continually occurring and solving itself; and as soon as the contradiction ceases, life also ceases and death steps in. (Friedrich Engels, *Anti-Duhring*, p. 120.)
This passage is characteristic of the Marxist thesis that contradiction is "objectively present in things and processes." Does Engels use "contradiction" in the logical sense? If not, what does he mean by the term?

6. In analyzing the Aristotelian codification, I had to deal with the two-valued, "either-or" type of orientation. I admit it baffled me for many years, that practically all humans, the lowest primitives not excluded, who never heard of Greek philosophers, have some sort of "either-or" type of evaluation. Then I made the obvious "discovery" that our relations to the world outside and inside our skins often happen to be, on the gross level, two-valued. For instance, we deal with day and night, land or water, etc. On the living level we have life or death, our hearts beat or not, we breathe or suffocate, are hot or cold, etc. Similar relations occur on higher levels. Thus, we have induction or deduction, materialism or idealism, capitalism or communism, democrat or republican, etc. And so on endlessly on all levels.

   In living, many issues are not so sharp, and therefore a system which posits the general sharpness of "either-or," and so objectifies "kind," is unduly limited; it must be revised and made more flexible in terms of "degree." This requires a physico-mathematical "way of thinking," which a non-Aristotelian system supplies. (Alfred Korzybski, *op. cit.*, p. vii.)
Do Korzybski's illustrations include both contraries and contradictories? What relevance does this have with respect to his criticism of the law of the excluded middle?

CHAPTER 12

COMPOUND PROPOSITIONS AND SYLLOGISMS

Section I: Compound Propositions

Up to this point we have been concerned with categorical propositions. Such propositions have terms, i.e., classes, as their constituent elements. We now turn our attention to compound propositions which have propositions as their constituent elements.

Thus, "All men are rational beings" has the terms "men" and "rational beings" as its constituent elements. The compound proposition "If men are rational, then a world community is a possibility" has two propositions as its elements, namely, "Men are rational" and "A world community is a possibility." By analogy with chemical analysis we may think of categorical propositions as being composed of atoms (terms), and compound propositions of molecules (propositions).

There are three major types of compound propositions, each having a distinctive set of connective words, and each being made up of subpropositions, which we shall customarily symbolize by the letters *p*, *q*, *r*, etc., which stand for propositions. Following is a list of the different types, with examples of each:

Hypothetical:	*If* prices continue to rise, *then* the unions will ask for wages increases.
Alternative:*	*Either* the nations will co-operate, *or* all will perish.
Conjunctive:	Americans believe in freedom of speech and Americans speak English.

Each type will now be considered in detail.

Section II: Hypothetical Propositions and Syllogisms

A hypothetical proposition is made up of two subpropositions connected by the words "if" and "then." The hypothetical proposition "*If* prices continue to rise *then* the unions will ask for wage increases" has two subpropositions. The first of these is called the "antecedent," the second the "consequent." We shall symbolize these by *p* and *q*. The structural form of the hypothetical proposition may thus be exhibited as follows:

If	*p* (antecedent)	then	*q* (consequent)
	(Prices continue to rise)		(The unions will ask for wage increases)

*Many writers use the term "disjunctive" for what we call "alternative" propositions.

"If *p* then *q*" means "If *p* is true then *q* is true" or "If what *p* asserts is the case, then what *q* asserts will be the case."

Let us now examine the precise meaning of the proposition: "If prices rise, then the unions will ask for wage increases." No assertion is made that either of the subpropositions taken alone is true. We have not said that prices will rise nor have we said that the unions will ask for wage increases. The only assertion we have made is that the consequent will follow if the antecedent occurs. *If* prices rise, we have said, then the unions will surely ask for wage increases.

Another meaning of this propositions is that if we find that the unions do *not* ask for wage increases, then we may conclude that prices have *not risen*, for if they had risen then the unions would have asked for increases.

This proposition, however, tells us nothing about what may happen if prices do not rise. There may be other reasons why unions ask for wage increases. Similarly, if we learn that the unions have asked for wage increases we cannot conclude that prices have risen, because of the aforesaid other reasons.

To sum up this expansion of the meaning of "If *p* then *q*," we have found that it involves four aspects:

1. If *p* is true, then *q* must be true.
2. If *p* is false, i.e., if *p* does not occur, then we can draw no conclusion concerning the truth or falsity of *q*.
3. If *q* is true *(q* occurred) then we can draw no conclusions concerning the truth or falsity of *p*.
4. If *q* is false *(q* did not occur) then we know *p* is false (did not occur).

It may be noted that the relation of *p* to *q* is that of implication. The relation of superimplication holds between *p* and *q* and that of subimplication holds between *q* and *p*. "If *p* then *q*" may thus be expressed in the form *"p* implies *q*."

2. Hypothetical syllogisms.

The rules of validity of the hypothetical syllogism are based upon the meaning of the hypothetical proposition.* The following hypothetical syllogism is an example of the so-called "mixed" type, i.e., it is made up of a hypothetical major premise, a categorical minor premise, and a conclusion:

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*The concepts of distribution and class analysis are now irrelevant since we are no longer dealing with terms.

If a battleship is gray, then it has been painted. (If *p* then *q*.)
p *q*

The battleship Missouri is gray. (*p*)
p

∴ The battleship Missouri has been painted. (∴*q*)
q

We shall refer to the hypothetical premise as the "major premise," and to the second premise as the "minor." Note the latter carefully. It introduces a "special case," the battleship "Missouri." The minor premise asserts that our special case has the characteristic stated in the antecedent of the major premise; hence, we say that the minor premise "affirms" the antecedent, and we symbolize the minor premise by "*p*," i.e., *p* is true. But the minor premise might have informed us that the antecedent did not apply to the Missouri, i.e., that the Missouri was *not* gray. This is to deny the antecedent, i.e., to say *p* is false, or "not-*p*," symbolized by "$\sim p$." There are two other possibilities. The minor might have informed us that our special case has the characteristics of the *consequent* of the major premise (symbolized by "*q*") or that it does not have it (symbolized by "$\sim q$," i.e., *q* is false). These four possibilities give us four "figures" of the hypothetical syllogisms, which take their names from what the minor premise asserts. They are as follows:

Figure 1. Affirming the antecedent:

If a battleship is gray, then it has been painted. If *p* then *q*.
The Missouri is gray (affirms antecedent). *p*
∴ It has been painted (affirms consequent). ∴ *q*

The hypothetical major premise asserts that the consequent will be true if the antecedent is the case. The minor premise asserts that the antecedent is the case (affirmed) so we may properly affirm the consequent. This valid argument form is often referred to as *modus ponens*.

Figure 2. Denying the antecedent:

If a battleship is gray, then it has been painted. If *p* then *q*.
The Missouri is not gray (denies antecedent). $\sim p$
∴ It has not been painted (denies consequent). ∴ $\sim q$

Here the minor premise tells us that the Missouri is not gray. We cannot properly conclude that it has not been painted. It may be painted in a different color, such as white. The major premise asserts that a ship has been painted *if* it is gray, but it does *not* assert that it has been painted *only* if it is gray. "Denying the antecedent" is an invalid argument form.

Figure 3. Affirming the consequent:

If a battleship is gray, then it has been painted. If *p* then *q*.
The Missouri has been painted (affirms consequent). *q*
∴ The Missouri is gray (affirms antecedent). ∴ *p*

The minor asserts that the Missouri has been painted. For the same reasons as above, this does not permit us to conclude that it is gray. This form is also invalid.

Figure 4. Denying the consequent:

If a battleship is gray, then it has been painted. — If p then q.
The Missouri has not been painted (denies consequent). — $\sim q$
∴ The Missouri is not gray (denies antecedent). — $\therefore \sim p$

This form is valid. If the Missouri is not painted, then it certainly cannot be gray, since only painted battleships are gray. When we deny the consequent of the major premise, then the antecedent must be false. Consider: If the antecedent is the case, then the consequent must be true. But if the consequent is not the case, then the antecedent cannot have occurred for if it had, then the consequent would have occurred. This valid form is called the *modus tollens*.

Exercises

A. State the figures of the following syllogisms, and note whether they are valid or invalid:

1.	2.	3.	4.
If p then q	If p then q	If p then q	If p then q
and $\sim q$	and q	and $\sim p$	and p
$\therefore \sim p$	$\therefore p$	$\therefore \sim q$	$\therefore q$

B. Analyze the following syllogisms for validity. Write out each with the hypothetical major premise stated first, the minor premise second, and the conclusion last. Underline the subpropositions of the major premise as p and q.

Two hints may be helpful in working out the last four exercises. Exercises 5 and 6 contain negative expressions. These may be symbolized by $\sim p$ or $\sim q$ as the case may be. Now, if the minor premise asserts $\sim p$ this would affirm, and p in the minor would deny $\sim p$, and similarly with $\sim q$ and q.

Note that a mixed hypothetical syllogism is always invalid when the minor premise denies the antecedent or affirms the consequent. But when the antecedent is affirmed or the consequent denied (Figures 1 and 4) then we must check the conclusion to determine whether it properly affirms the consequent, as in Figure 1, or denies the antecedent, as in Figure 4.

1. If a man can vote, then he is a citizen. John is not allowed to vote, so we may conclude that he is not a citizen.
2. If a man can vote, then he is a citizen. John can vote, for he is a citizen.
3. If a sailor desires submarine duty, then he must be a brave man. But Bill cannot be a brave man, for he did not desire submarine duty.

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*The pages between 277 and 291 were not reproduced leaving out sections III, IV & V of this chapter which are not included in this course.

Section VI: The Dilemma

1. The meaning of dilemma

A young man was considering the pros and cons of marriage. Being of a somewhat sombre and pessimistic turn of mind, his reflections took the following form: "If I get married, then I shall undertake grave responsibilities and worries. That's not so good. On the other hand, if I remain single, then I shall often be lonely without the companionship of some lovely woman. And that's not so good. What to do?"

This young man found himself confronted with a dilemma. A dictionary defines a dilemma as "a situation in which we are forced to make a choice between equally undesirable alternatives; in other words, a perplexing predicament." This is the way the term is popularly understood. This usage may even cover some "perplexing predicaments" in which the choices are between equally desirable alternatives as in the case of the child in Proust's *Remembrance of Things Past* who could not make up his mind when given the choice of two tempting kinds of dessert. For his alternatives were also undesirable: whichever one he chose, he would lose the other.

In debating, or argument generally, the dilemma is an effective rhetorical device for putting one's opponent "in a hole." Most dilemmas involve perplexing predicaments. But in logic, "dilemma" means a certain kind of logical structure, and its conclusions may be either pleasant or unpleasant. As a logical form the dilemma, as we shall see, combines some of the forms we have studied in this chapter and involves no new principles of proof.

2. The analysis of dilemmas

We shall now analyze a dilemma. The President, Senators, and Congressmen are confronted with dilemmas whenever they act on controversial legislation. Whichever way they act they will lose votes. The dilemma arises when the alternatives are of equal (or nearly equal) importance. Thus, when controversial labor legislation comes to the president's desk, the president may say to himself: "If I sign this bill, I will lose many labor votes. If I veto it, I will lose many conservative votes. But I must either sign or veto. Thus in either case I shall lose votes." This dilemma has the following structure:

If I sign this bill (p), then I will lose many labor votes (q), and

If I veto this bill (r), then I will lose many conservative votes (s).

But either I sign this bill (p), or I veto this bill (r).

Therefore, either I lose labor votes (q) or I lose conservative votes (s).

Note the structure of the argument. It is made up of two syllogisms in hypothetical form:

If *p* then *q*	and	If *r* then *s*
p	or	*r*
∴ *q*	or	*s*

These elements are combined in the following manner. The major premise is a complex conjunctive proposition, made up of *two* hypothetical propositions. The minor premise is an alternative proposition in which the two antecedents of the hypotheticals in the major premise are affirmed. The conclusion, another alternative proposition, then goes on to affirm the consequents. This type of dilemma is called "constructive."

The dilemma should of course be stated in valid form. This requires that the antecedents of the major premise be affirmed, or its consequents denied. A dilemma in which the consequents are denied (the "destructive dilemma") is illustrated by:

> If you were a loyal member of the party, then you would wish to support our leader when he is right; and if you were intelligent you would see that he is right.
> But either you don't wish to support him when he is right or you don't understand that he is in the right.
> Therefore, either you are not loyal, or you are not intelligent.

Stated symbolically, we have:

	If *p* then *q*	and if *r* then *s*
But either	$\sim q$	or $\sim s$
∴ either	$\sim p$	or $\sim r$

The types of dilemma we have analyzed above are called "complex," since the consequents and antecedents are different propositions. In "simple" dilemmas, either the antecedents are the same or the consequents are the same. Thus:

If *p* then *q* and if *p* then *r*	If *p* then *q* and if *r* then *q*
But either $\sim q$ or $\sim r$	But either *p* or *r*
Therefore $\sim p$ or $\sim p$ (i.e., $\sim p$)	Therefore *q* or *q* (i.e., *q*)

3. The criticism of a dilemma

A dilemma may of course be formally invalid, but typically the criticism of a dilemma is based upon material rather than formal considerations. Let us suppose that you are in a debate. Your opponent charges that you are enmeshed in a dilemma from which you cannot escape and that this dilemma places you in an embarrassing predicament. Assuming that you opponent's argument is formally valid, there are nevertheless three possible modes of escape from the "embarrassing predicament" in which he claims that he has placed you. You may be able to "escape through the horns," or "take the dilemma by the horns," or "rebut." These defenses are based upon factual rather than formal considerations. If the facts are not with you, then you may find the dilemma "impregnable."

a. Escaping through the horns

The horns of the dilemma are the two alternants stated in the minor premise: "Either *p* or *r*." This implies that there are only two possibilities. But are these actually the only alternatives? If they are not, then we may "escape" through these horns by showing that there are other alternatives, such as *t*, etc. We then assert that *p* and *r* are not exhaustive of the possibilities, that we may escape the devil and the frying pan and not find ourselves in either the deep blue sea or the fire.

This form of attack cannot always be used. The young man contemplating marriage could not use this attack, since he must either remain single or get married. The alternatives exhaust the possibilities. But consider the following dilemma concerning the Caliph Omar, who ordered the destruction of the famous library at Alexandria, Egypt. He is reported to have reasoned as follows: "If these books contain the same doctrines as those of the Koran, then they are unnecessary. If they contradict the doctrines of the Koran, then they are pernicious. Destroy them!"

But there are other possibilities. Mathematical treatises, for example, do not contain the doctrines of the Koran nor do they contradict these doctrines.

Our analysis may be generalized. It is impossible to slip through the horns of a dilemma when the alternatives are genuine contradictories, since one or the other must hold, but it is possible to slip through the horns when the alternatives are contraries. In the last example the alternatives were contraries.

One final comment: Alternatives may not be contradictories, but circumstances may rule out a third possibility. Thus "sign the bill" and "veto the bill" are not formal contradictories, since one might do nothing. But our Constitution makes "doing nothing" equivalent to a veto under certain circumstances and equivalent to signing under others, so that there was no third alternative open to the President. No escape between the horns was possible.

b. Taking the dilemma by the horns

To "take the dilemma by the horns" means to deny the consequences alleged to flow from *p* or to deny the consequences alleged to flow from *r*. To do either one of these things (or both) is to deny the major premise of the dilemma. We deny that *q* follows from *p* or that *s* follows from *r*. A dilemma based on a false premise is a specious one.

The "not loyal or not intelligent" conclusion might be avoided by attacking the horn of the dilemma which says "If you were intelligent then you would understand that he is in the right." Possibly an intelligent person might find that the leader was wrong. Whether this is so or not, however, depends on the facts, or material truth, and not on formal considerations.

c. *Rebuttal, or the "counter-dilemma"*

This form of escape is sometimes effective where the others fail. Let us assume that the premises of the dilemma are true and the alternatives exhaustive. Escape from the embarrassing predicament may yet be possible. "A cloud may have a silver lining" just as "every rose has a thorn." Choices involve sacrifices, but sacrifices often bring compensating gains. The counter dilemma emphasizes the silver lining. But, as we well know, it is not true without exception that every cloud has a silver lining, so this form of escape is not always possible. The facts of the situation must be considered in each specific case.

Thus our pessimistic young man might be told to look at the situation from a different point of view. "If you get married," we tell him, "you will not be lonely, and if you remain single then you will avoid the cares and responsibilities of marriage. Both alternatives now appear favorable, and his embarrassing predicament has been eliminated. What we have done here is to emphasize different aspects of the same factual situation. The same facts may appear desirable or undesirable, depending upon the point of view, as in the case of the child and his dessert.

Let us set the formal structures of the dilemma and counter-dilemma side by side:

Dilemma	*Counter-dilemma*
If p then q, and if r then s	If p then $\sim s$ and if r then $\sim q$
But either p or r	But either p or r
$\therefore$ Either q or s	$\therefore$ Either $\sim s$ or $\sim q$

The major premise of the counter-dilemma contradicts the original consequents and reverses their order. Note, however, that the conclusion of the counter-dilemma is *not* the contradictory of the conclusion of the original dilemma. "Either I will have responsibilities or I will be lonely" is quite consistent with "Either I won't be lonely or I won't have responsibilities." The contradictory of the original conclusion would be: I won't be lonely and I won't have responsibilities. The counter-dilemma does not deny the facts stated in the original dilemma; it merely looks at them in a different way.

But not all counter-dilemmas are effective, nor indeed do all of them "make sense." Whether any one of the three attacks we have noted is effective will always depend upon the facts of the particular situation. An attack against a dilemma may be strong, or it may be weak. There are no rules which determine the persuasiveness of an attack; your own common sense must be the judge.