3. Some mammals are not horses, for no horses are centaurs, and all centaurs are mammals.

4. Some neurotics are not parasites, but all criminals are parasites; it follows that some neurotics are not criminals.

*5. All underwater craft are submarines; therefore no submarines are pleasure vessels, because no pleasure vessels are underwater craft.

6. No criminals were pioneers, for all criminals are unsavory persons, and no pioneers were unsavory persons.

7. No musicians are astronauts; all musicians are baseball fans; consequently, no astronauts are baseball fans.

8. Some Christians are not Methodists, for some Christians are not Protestants, and some Protestants are not Methodists.

9. No people whose primary interest is in winning elections are true liberals, and all active politicians are people whose primary interest is in winning elections, which entails that no true liberals are active politicians.

*10. No weaklings are labor leaders, because no weaklings are true liberals, and all labor leaders are true liberals.

6.4 Syllogistic Rules and Syllogistic Fallacies

A syllogism may fail to establish its conclusion in many different ways. To help avoid common errors we set forth rules—six of them—to guide the reasoner; any given standard-form syllogism can be evaluated by observing whether any one of these rules has been violated. Mastering the rules by which syllogisms may be evaluated also enriches our understanding of the syllogism itself; it helps us to see how syllogisms work, and to see why they fail to work if the rules are broken.

A violation of any one of these rules is a mistake, and it renders the syllogism invalid. Because it is a mistake of that special kind, we call it a fallacy; and because it is a mistake in the form of the argument, we call it a formal fallacy (to be contrasted with the informal fallacies described in Chapter 4). In reasoning with syllogisms, one must scrupulously avoid the fallacies that violations of the rules invariably yield. Each of these formal fallacies has a traditional name, explained below.

**Rule 1. Avoid four terms.**

*A valid standard-form categorical syllogism must contain exactly three terms, each of which is used in the same sense throughout the argument.*

In every categorical syllogism, the conclusion asserts a relationship between two terms, the subject (minor term) and the predicate (major term). Such a conclusion
can be justified only if the premises assert the relationship of each of those two terms to the same third term (middle term). If the premises fail to do this consistently, the needed connection of the two terms in the conclusion cannot be established, and the argument fails. So every valid categorical syllogism must involve three terms—no more and no less. If more than three terms are involved, the syllogism is invalid. The fallacy thus committed is called the fallacy of four terms.

The mistake that commonly underlies this fallacy is equivocation, using one word or phrase with two different meanings. Most often it is the middle term whose meaning is thus shifted, in one direction to connect it with the minor term, in a different direction to connect it with the major term. In doing this the two terms of the conclusion are connected with two different terms (rather than with the same middle term), and so the relationship asserted by the conclusion is not established.*

When the expression “categorical syllogism” was defined at the beginning of this chapter, we noted that by its nature every syllogism must have three and only three terms.† So this rule (“Avoid four terms”) may be regarded as a reminder to make sure that the argument being appraised really is a categorical syllogism.

Rule 2. Distribute the middle term in at least one premise.

A term is “distributed” in a proposition when (as was explained in Section 5.4) the proposition refers to all members of the class designated by that term. If the middle term is not distributed in at least one premise, the connection required by the conclusion cannot be made.

Historian Barbara Tuchman (in The Proud Tower, New York: Macmillan, 1966) observed that many early critics of anarchism relied on the following “unconscious syllogism”:

All Russians were revolutionists.
All anarchists were revolutionists.
Therefore, all anarchists were Russians.

This syllogism is plainly invalid. Its mistake is that it asserts a connection between anarchists and Russians by relying on the links between each of those classes and the class of revolutionists—but revolutionists is an undistributed term in both of the premises. The first premise does not refer to all revolutionists,

*Because it is the middle term that is most often manipulated, this fallacy is sometimes called “the fallacy of the ambiguous middle.” However, this name is not generally applicable, because one (or more) of the other terms may have its meaning shifted as well. Ambiguities may result in as many as five or six different terms being involved, but the mistake retains its traditional name: the fallacy of four terms.
†The term syllogism is sometimes defined more broadly than it has been in this book. The informal fallacy of equivocation, explained and warned against in Chapter 4, may arise in many different argumentative contexts, of course.
and neither does the second. Revolutionists is the middle term in this argument, and if the middle term is not distributed in at least one premise of a syllogism, that syllogism cannot be valid. The fallacy this syllogism commits is called the **fallacy of the undistributed middle**.

What underlies this rule is the need to link the minor and the major terms. If they are to be linked by the middle term, either the subject or the predicate of the conclusion must be related to the whole of the class designated by the middle term. If that is not so, it is possible that each of the terms in the conclusion may be connected to a different part of the middle term, and not necessarily connected with each other.

This is precisely what happens in the syllogism given in the preceding example. The Russians are included in a part of the class of revolutionists (by the first premise), and the anarchists are included in a part of the class of revolutionists (by the second premise)—but different parts of this class (the middle term of the syllogism) may be involved, and so the middle term does not successfully link the minor and major terms of the syllogism. In a valid syllogism, the middle term must be distributed in at least one premise.

**Rule 3.** Any term distributed in the conclusion must be distributed in the premises.

To refer to all members of a class is to say more about that class than is said when only some of its members are referred to. Therefore, when the conclusion of a syllogism distributes a term that was undistributed in the premises, it says more about that term than the premises did. But a valid argument is one whose premises logically entail its conclusion, and for that to be true the conclusion must not assert any more than is asserted in the premises. A term that is distributed in the conclusion but is not distributed in the premises is therefore a sure mark that the conclusion has gone beyond its premises and has reached too far. The fallacy is that of **illicit process**.

The conclusion may overreach with respect to either the minor term (its subject), or the major term (its predicate). So there are two different forms of illicit process, and different names have been given to the two formal fallacies involved. They are

Illicit process of the major term (an **illicit major**).

Illicit process of the minor term (an **illicit minor**).

To illustrate an illicit process of the major term, consider this syllogism:

All dogs are mammals.

No cats are dogs.

Therefore no cats are mammals.
The reasoning is obviously bad, but where is the mistake? The mistake is in the conclusion’s assertion about all mammals, saying that all of them fall outside the class of cats. Bear in mind that an A proposition distributes its subject term but does not distribute its predicate term. Hence the premises make no assertion about all mammals—so the conclusion illicitly goes beyond what the premises assert. Because “mammals” is the major term in this syllogism, the fallacy here is that of an illicit major.

To illustrate illicit process of the minor term, consider this syllogism:

All traditionally religious people are fundamentalists.

All traditionally religious people are opponents of abortion.

Therefore all opponents of abortion are fundamentalists.

Again we sense quickly that something is wrong with this argument, and what is wrong is this: The conclusion makes an assertion about all opponents of abortion, but the premises make no such assertion; they say nothing about all abortion opponents. So the conclusion here goes illicitly beyond what the premises warrant. And in this case “opponents of abortion” is the minor term, so the fallacy is that of an illicit minor.

**Rule 4. Avoid two negative premises.**

Any negative proposition (E or O) denies class inclusion; it asserts that some or all of one class is excluded from the whole of the other class. Two premises asserting such exclusion cannot yield the linkage that the conclusion asserts, and therefore cannot yield a valid argument. The mistake is named the **fallacy of exclusive premises**.

Understanding the mistake identified here requires some reflection. Suppose we label the minor, major, and middle terms of the syllogism $S$, $P$, and $M$, respectively. What can two negative premises tell us about the relations of these three terms? They can tell us that $S$ (the subject of the conclusion) is wholly or partially excluded from all or part of $M$ (the middle term), and that $P$ (the predicate of the conclusion) is wholly or partially excluded from all or part of $M$. However, any one of these relations may very well be established no matter how $S$ and $P$ are related. The negative premises cannot tell us that $S$ and $P$ are related by inclusion or by exclusion, partial or complete. Two negative premises (where $M$ is a term in each) simply cannot justify the assertion of any relationship whatever between $S$ and $P$. Therefore, if both premises of a syllogism are negative, the argument must be invalid.

**Rule 5. If either premise is negative, the conclusion must be negative.**

If the conclusion is affirmative—that is, if it asserts that one of the two classes, $S$ or $P$, is wholly or partly contained in the other—it can only be inferred from premises that assert the existence of a third class that contains the first and
is itself contained in the second. However, class inclusion can be stated only by affirmative propositions. Therefore, an affirmative conclusion can follow validly only from two affirmative premises. The mistake here is called the fallacy of drawing an affirmative conclusion from a negative premise.

If an affirmative conclusion requires two affirmative premises, as has just been shown, we can know with certainty that if either of the premises is negative, the conclusion must also be negative, or the argument is not valid.

Unlike some of the fallacies identified here, this fallacy is not common, because any argument that draws an affirmative conclusion from negative premises will be instantly recognized as highly implausible. Even an illustration of the mistake will appear strained:

No poets are accountants.
Some artists are poets.
Therefore some artists are accountants.

Immediately it will be seen that the exclusion of poets and accountants, asserted by the first premise of this syllogism, cannot justify any valid inference regarding the inclusion of artists and accountants.

**Rule 6.** From two universal premises no particular conclusion may be drawn.

In the Boolean interpretation of categorical propositions (explained in Section 5.7), universal propositions (\(A\) and \(E\)) have no existential import, but particular propositions (\(I\) and \(O\)) do have such import. Wherever the Boolean interpretation is supposed, as in this book, a rule is needed that precludes passage from premises that have no existential import to a conclusion that does have such import.

This final rule is not needed in the traditional or Aristotelian account of the categorical syllogism, because that traditional account paid no attention to the problem of existential import. However, when existential import is carefully considered, it will be clear that if the premises of an argument do not assert the existence of anything at all, the conclusion will be unwarranted when, from it, the existence of some thing may be inferred. The mistake is called the existential fallacy.

Here is an example of a syllogism that commits this fallacy:

All household pets are domestic animals.
No unicorns are domestic animals.
Therefore some unicorns are not household pets.

If the conclusion of this argument were the universal proposition, “No unicorns are household pets,” the syllogism would be perfectly valid for all. And because, under the traditional interpretation, existential import may be inferred from universal as well as from particular propositions, it would not be problematic
(in that traditional view) to say that the conclusion in the example given here is simply a “weaker” version of the conclusion we all agree is validly drawn.

In our Boolean view, however, the conclusion of the example (“Some unicorns are not household pets”), because it is a particular proposition, is not just “weaker,” it is very different. It is an O proposition, a particular proposition, and thus has an existential import that the E proposition (“No unicorns are household pets”) cannot have. Reasoning that is acceptable under the traditional view is therefore unacceptable under the Boolean view because, from the Boolean perspective, that reasoning commits the existential fallacy—a mistake that cannot be made under the traditional interpretation.*

The six rules given here are intended to apply only to standard-form categorical syllogisms. In this realm they provide an adequate test for the validity of any argument. If a standard-form categorical syllogism violates any one of these rules, it is invalid; if it conforms to all of these rules, it is valid.

### OVERVIEW

<table>
<thead>
<tr>
<th>Syllogistic Rules and Fallacies</th>
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<tbody>
<tr>
<td>Rule</td>
</tr>
<tr>
<td>1. Avoid four terms.</td>
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<td>2. Distribute the middle term in at least one premise.</td>
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<tr>
<td>3. Any term distributed in the conclusion must be distributed in the premises.</td>
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<tr>
<td>4. Avoid two negative premises.</td>
</tr>
<tr>
<td>5. If either premise is negative, the conclusion must be negative.</td>
</tr>
<tr>
<td>6. No particular conclusion may be drawn from two universal premises.</td>
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</tbody>
</table>

*Another interesting consequence of the difference between the traditional and the Boolean interpretation of categorical propositions is this: In the traditional view there is a need for a rule that states the converse of Rule 5 (“If either premise is negative, the conclusion must be negative”). The converse states simply that “If the conclusion of a valid syllogism is negative, at least one premise must be negative.” And that is indisputable, because if the conclusion is negative, it denies inclusion. But affirmative premises assert inclusion. Therefore affirmative premises cannot entail a negative conclusion. This corollary is unnecessary in the Boolean interpretation because the rule precluding the existential fallacy (Rule 6) will, in the presence of the other rules, suffice to invalidate any syllogism with affirmative premises and a negative conclusion.
FLOWCHART FOR APPLYING THE SIX SYLLOGISTIC RULES

The following chart captures the process for working through the six rules of validity for categorical syllogisms.

Identify the premises and the conclusion.

Does the argument have exactly three terms used consistently throughout?

NO

Fallacy of Four Terms. STOP. No other fallacy can be committed. The argument is INVALID.

YES

Is the middle term distributed at least once?

NO

Fallacy of Undistributed Middle

YES

Is the major term distributed in the conclusion?

YES

Is the major term distributed in the major premise?

NO

Fallacy of Illicit Major

YES

Is the minor term distributed in the conclusion?

YES

Is the minor term distributed in the minor premise?

NO

Fallacy of Illicit Minor

NO

Fallacy of Illicit Minor
6.4 Syllogistic Rules and Syllogistic Fallacies

- Are there two negative premises?
  - NO
- Is there an affirmative conclusion?
  - YES
- Is there a negative premise?
  - YES
- Is there a particular conclusion?
  - YES
- Has a fallacy been committed?
  - YES
  - The argument is INVALID
  - NO
  - The argument is VALID

- NO
- Is there a particular premise?
  - NO
  - Existential Fallacy
  - YES
  - Fallacy of Affirmative Conclusion from a Negative Premise

EXERCISES

A. Identify the rule that is broken by invalid syllogisms of the following forms, and name the fallacy that each commits.

EXAMPLE

1. AAA–2

SOLUTION

Any syllogism in the second figure has the middle term as predicate of both the major and the minor premise. Thus any syllogism consisting of three A propositions, in the second figure, must read: All P is M; all S is M; therefore all S is P. M is not distributed in either of the premises in that form, and therefore it cannot validly be inferred from such premises that all S is P. Thus every syllogism of the form AAA–2 violates the rule that the middle term must be distributed in at least one premise, thereby committing the fallacy of the undistributed middle.

2. EAA–1
3. IAO–3
4. OEO–4
*5. AAA–3
6. IAI–2
7. OAA–3
8. EAO–4
9. OAI–3
*10. IEO–1
11. EAO–3
12. AII–2
13. EEE–1
14. OAO–2
*15. IAA–3

B. Identify the rule that is broken by any of the following syllogisms that are invalid, and name the fallacy that is committed.
EXAMPLE

1. All textbooks are books intended for careful study.

Some reference books are books intended for careful study.

Therefore some reference books are textbooks.

SOLUTION

In this syllogism, “textbooks” is the major term (the predicate of the conclusion) and “reference books” is the minor term (the subject of the conclusion). “Books intended for careful study” is therefore the middle term, and it appears as the predicate of both premises. In neither of the premises is this middle term distributed, so the syllogism violates the rule that the middle term must be distributed in at least one premise, thereby committing the fallacy of the undistributed middle.

2. All criminal actions are wicked deeds.

All prosecutions for murder are criminal actions.

Therefore all prosecutions for murder are wicked deeds.

3. No tragic actors are idiots.

Some comedians are not idiots.

Therefore some comedians are not tragic actors.

4. Some parrots are not pests.

All parrots are pets.

Therefore no pets are pests.

5. All perpetual motion devices are 100 percent efficient machines.

All 100 percent efficient machines are machines with frictionless bearings.

Therefore some machines with frictionless bearings are perpetual motion devices.

6. Some good actors are not powerful athletes.

All professional wrestlers are powerful athletes.

Therefore all professional wrestlers are good actors.

7. Some diamonds are precious stones.

Some carbon compounds are not diamonds.

Therefore some carbon compounds are not precious stones.
8. Some diamonds are not precious stones.
   Some carbon compounds are diamonds.
   Therefore some carbon compounds are not precious stones.

9. All people who are most hungry are people who eat most.
   All people who eat least are people who are most hungry.
   Therefore all people who eat least are people who eat most.

10. Some spaniels are not good hunters.
    All spaniels are gentle dogs.
    Therefore no gentle dogs are good hunters.

C. Identify the rule that is broken by any of the following syllogisms that are invalid, and name the fallacy that is committed.

   **EXAMPLE**

   1. All chocolate eclairs are fattening foods, because all chocolate eclairs are rich desserts, and some fattening foods are not rich desserts.

   **SOLUTION**

   In this syllogism the conclusion is affirmative ("all chocolate eclairs are fattening foods"), while one of the premises is negative ("some fattening foods are not rich desserts"). The syllogism therefore is invalid, violating the rule that if either premise is negative the conclusion must also be negative, thereby committing the fallacy of affirmative conclusion from a negative premise.

   2. All inventors are people who see new patterns in familiar things, so all inventors are eccentrics, because all eccentrics are people who see new patterns in familiar things.

   3. Some snakes are not dangerous animals, but all snakes are reptiles, therefore some dangerous animals are not reptiles.

   4. Some foods that contain iron are toxic substances, for all fish containing mercury are foods that contain iron, and all fish containing mercury are toxic substances.

   5. All opponents of basic economic and political changes are outspoken critics of the liberal leaders of Congress, and all right-wing extremists are opponents of basic economic and political changes. It follows that all outspoken critics of the liberal leaders of Congress are right-wing extremists.

   6. No writers of lewd and sensational articles are honest and decent citizens, but some journalists are not writers of lewd and sensational articles; consequently, some journalists are honest and decent citizens.
7. All supporters of popular government are democrats, so all support-
ers of popular government are opponents of the Republican Party, inasmuch as all Democrats are opponents of the Republican Party.

8. No coal-tar derivatives are nourishing foods, because all artificial dyes are coal-tar derivatives, and no artificial dyes are nourishing foods.

9. No coal-tar derivatives are nourishing foods, because no coal-tar de-
rivatives are natural grain products, and all natural grain products are
nourishing foods.

*10. All people who live in London are people who drink tea, and all peo-
ple who drink tea are people who like it. We may conclude, then, that all people who live in London are people who like it.

6.5 Exposition of the Fifteen Valid Forms of the Categorical Syllogism

The mood of a syllogism is its character as determined by the forms (A, E, I, or O) of the three propositions it contains. There are sixty-four possible moods of the categorical syllogism; that is, sixty-four possible sets of three propositions: AAA, AAI, AAE, and so on, to . . . EOO, OOO.

The figure of a syllogism is its logical shape, as determined by the position of the middle term in its premises. So there are four possible figures, which can be most clearly grasped if one has in mind a chart, or iconic representation, of the four possibilities, as exhibited in the Overview table:

<table>
<thead>
<tr>
<th>Schematic Representation</th>
<th>First Figure</th>
<th>Second Figure</th>
<th>Third Figure</th>
<th>Fourth Figure</th>
</tr>
</thead>
<tbody>
<tr>
<td>M – S</td>
<td>S – M</td>
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</tbody>
</table>

Description:
- The middle term is the subject of the major premise and the predicate of the minor premise.
- The middle term is the predicate of both major and minor premises.
- The middle term is the subject of both the major and minor premises.
- The middle term is the predicate of the major premise and the subject of the minor premise.