Chapter 10

Additional Syllogisms

Though syllogisms hang not upon my tongue,
I am not surely always in the wrong!
'Tis hard if all is false that I advance—
A fool must now and then be right, by chance.

William Cowper

As we saw in Chapter 6, having a “sense” about the validity of an argument is not very reliable. And just as Cowper’s fool “must now and then be right, by chance,” so, too, must he be wrong.

Even if we always can’t be right, we have reduced the likelihood of being wrong by learning how to prove the validity or invalidity of standard-form categorical syllogisms. But not all syllogisms are standard-form categorical syllogisms, and thus don’t lend themselves to the methods of proving validity. We’ve discussed so far methods that apply only to standard-form categorical syllogisms. Consider, for example, this argument:

If all syllogisms are standard-form syllogisms, we have adequate means available for proving their validity.
Not all syllogisms are standard-form categorical syllogisms.
We do not have adequate means available for proving their validity.

Is it valid? Perhaps we can figure that out if we think about it carefully. But there is a better, more efficient, way of analyzing such syllogisms than just trying to “figure them out,” which is the subject of this chapter. (By the way, the syllogism in question is invalid. It is an example of a commonly committed fallacy, called the fallacy of denying the antecedent, which we will learn about as part of our study of nonstandard syllogisms.)
In this chapter we'll discuss two of the most common patterns of deductive reasoning—patterns we naturally use as part of our everyday reasoning. We will also reinforce and add to our understanding of the concept of logical form. We will learn to recognize the forms of three nonstandard syllogisms and also how to simplify them. In Chapter 9 we learned how to "translate" or reconstruct syllogisms in ordinary language into standard-form categorical propositions. With the completion of this chapter, we will have a firm grasp on the basics of deductive reasoning and a supply of some basic analytic tools for handy reference.

We'll begin with a look at an argument form we encounter almost daily: the disjunctive syllogism.

**DISJUNCTIVE SYLLOGISMS**

We often find ourselves choosing between alternatives which we express in propositions containing the word or, as in, "Either you're for me or you're against me," or "Would you like soup or salad with that tofu, sir?" Notice that the preceding sentence contains alternative examples. In the common understanding of these examples—assuming the second occurs in a restaurant—the choice is between one alternative or the other. Trying to have both is implicitly forbidden. But sometimes alternatives allow for choosing one or the other or both, as in "Is the student a scholar or an athlete?" Both alternatives are possible in this case.

These examples remind us that in English we use the single word or in two senses. For example, in a statement on a restaurant menu such as "Dinner includes soup or salad," or means clearly *either* soup *or* salad *but not both.* This meaning, termed the "exclusive sense of or," is clear to most of us from the context: in this case, the context of a restaurant menu. But in "All those eligible for welfare are unemployed or infirm," or is used in a "weaker" sense known as the inclusive sense. In this example of the "weaker" sense, the statement asserts that one could be either unemployed *or* infirm and allows for the possibility of being both unemployed and infirm. The inclusive or asserts that *at least one of the alternative statements is true.* Thus, "All those eligible for welfare are at least unemployed or infirm."

The alternative statements joined by the inclusive or are called *disjunctions.* The statement including both disjuncts and the inclusive or is called a disjunction. A disjunction is true if either of the disjuncts is true. This is another way of saying that a disjunction is true whenever *at least one* of its disjuncts is true.

**Study Hint**

Inclusive or asserts that at least one of the disjuncts is true.
A disjunction is false in only one case: when both disjuncts are false.

Recall that a syllogism consists of two premises and a conclusion. When a disjunction occurs as the premise of a syllogism, the syllogism is called a *disjunctive syllogism.* *Valid disjunctive syllogisms contain a disjunction as one premise, the negation of one of the disjuncts as the second premise, and the affirmation of the*
remaining disjunct as the conclusion. The basic form of valid disjunctive syllogisms looks like this:

\[
\begin{array}{c|c}
\text{Either this or that} & \text{Either this or that} \\
\text{not this} & \text{not that} \\
\text{that} & \text{this}
\end{array}
\]

Here’s an example:

Either some students are scholars or they are athletes.
Some students are not scholars.
Then some are athletes.

Notice that the second proposition negates (or denies) one of the disjuncts, and the conclusion affirms the other. Since to assert a disjunction is to assert that at least one of the disjuncts is true, we may validly infer such a conclusion if both premises are treated as being true. In our example, the conclusion “Then some are athletes” must logically follow. Let’s look at another example:

Either the plane has crashed or it’s been delayed.
The plane has not been delayed.
Therefore the plane has crashed.

Here, too, the second premise denies one of the disjuncts and the conclusion affirms the other. This is the same logical pattern—or form—as the first example. It, too, is valid.

On the other hand, consider this argument:

Either the plane has crashed or it’s been delayed.
The plane has been delayed.
Therefore the plane has not crashed.

Notice that the second premise does not deny either disjunct; rather it affirms one of them. Is it possible for both disjuncts to be true? Yes—that’s the meaning of disjunction. It allows for the possibility that the plane has been delayed and has also crashed: Our second premise is merely telling us that at least one of those two disjuncts is true. The meaning of disjunction, as defined above, only says that at least one disjunction must be true—it also always allows for the possibility that both might be. Consequently, the conclusion in this example does not follow from the premises with logical certainty—it goes beyond them. So this example is invalid.

Last, consider this example:

The Senator is qualified to be either President or Vice-President.
The Senator is qualified to be President.
Therefore she’s not qualified to be Vice-President.
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As we've already noted, affirming one of the disjuncts does not deny the other. The conclusion, because it does not necessarily follow from the premises, is invalidly drawn. This argument, too, is invalid.

Using \( p \) and \( q \) to represent any two propositions, let's contrast the basic form of valid and invalid disjunctive syllogisms:

<table>
<thead>
<tr>
<th>Valid disjunctive syllogism</th>
<th>Invalid disjunctive syllogism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Either ( p ) or ( q )</td>
<td>Either ( p ) or ( q )</td>
</tr>
<tr>
<td>not ( p )</td>
<td>( p )</td>
</tr>
<tr>
<td>Therefore, ( q )</td>
<td>Therefore, not ( q )</td>
</tr>
</tbody>
</table>

EXERCISE 10–1*

Determine the validity of the following disjunctive syllogisms.

1. There's either a fuel shortage or the government is lying.
   There is a fuel shortage.
   Therefore the government is not lying.

2. Either the general is guilty of obstructing justice or he's a patriot.
   The general is no patriot.
   Then the general is guilty of obstructing justice.

3. The United States either supports the Iraqis or the Kuwaitis in the Middle East.
   The United States supports the Iraqis.
   Therefore, the United States does not support the Kuwaitis.

4. Whether we like it or not—and we probably don't—we must either become energy self-sufficient or resign ourselves to international blackmail.
   We must not resign ourselves to international blackmail.
   Hence we must become energy self-sufficient.

5. The matter of the universe will continue to expand to extinction, or it will begin to contract, in which case another “big bang” will eventually occur.
   The matter of the universe will continue to expand.
   So the matter of the universe will not begin to contract and thus another “big bang” will not eventually occur.

6. Either all \( S \) is \( P \) or no \( S \) is \( P \).
   Some \( S \) is not \( P \).
   It follows that no \( S \) is \( P \).

7. Either some \( S \) is \( P \) or some \( S \) is not \( P \).
   No \( S \) is \( P \).
   Therefore some \( S \) is not \( P \).
8. Either all $S$ is $P$ or some $S$ is $P$.
   Some $S$ is not $P$.
   So some $S$ is $P$.

9. Either no $S$ is $P$ or some $S$ is not $P$.
   No $S$ is $P$.
   Then some $S$ is not $P$.

**CONDITIONAL SYLLOGISMS**

We sometimes express the conditions under which something will occur in "if . . . then" form as in, "If I have time, I’ll drop your suit off at the cleaners," or "If you love me, you’ll be nice to my dog." "If . . . then" statements assert a conditional relationship only. They do not promise or guarantee that those conditions will be met. I may not have time to drop your suit off at the cleaners, or you may not love me.

Certain "if . . . then" statements are called conditionals, hypotheticals, or implications. We’ll call the statement that occurs between if and then the antecedent of the conditional, and we’ll call the statement that follows then the consequent. This is a special kind of conditional known as a material conditional. (Other kinds of conditionals are logical, definitional, causal, and decisional. We are concerned only with material conditionals.)

Let’s see how a material conditional statement is true by considering the following example: "If it’s raining, the game is cancelled." This conditional is true provided that "the game is cancelled" is not false at the same time that "it is raining" is true. A conditional statement is true if and only if the consequent is not false and the antecedent true. Every conditional statement—whatever else it may mean—asserts this relationship: It denies that its antecedent is true and its conditional false. Although this may seem odd, remember that we are talking about only one type of conditional statement, the material conditional as logicians call it.

Conditional statements can occur as the premises of arguments. Consider the following syllogism:

**If we begin recycling efforts immediately, we have a good chance of saving the environment.**

**We begin recycling efforts immediately.**

**We have a good chance of saving the environment.**

This argument form is called a **mixed-conditional syllogism**. It is "mixed" because it contains a conditional premise and a second simple premise. If we look carefully at this argument we notice that the second premise affirms the antecedent of the conditional premise and the conclusion affirms the consequent. This form is valid. Such arguments are said to be in the **affirmative mood**; they are commonly referred to by their Latin name: *modus ponens*. Any time the second premise of a mixed
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conditional syllogism affirms the antecedent of the conditional premise and the conclusion affirms its consequent, the syllogism is valid.

There's a fallacy that superficially resembles modus ponens:

If we begin recycling efforts immediately, we have a good chance of saving the environment.
We have a good chance of saving the environment.
We begin recycling efforts immediately.

Even if this conclusion is, in fact, true, it does not logically follow from the premises. Consider a very simple instance of the same fallacious pattern:

If my car is out of gas, it will not start.
My car will not start.
My car is out of gas.

Even if the conclusion is, in fact, true, the argument upon which it is based is flawed. Based only on the information provided in the premises, the conclusion "my car is out of gas" is too strong for the premises. Other factors may account for my car's not starting: bad battery, failed ignition, and so forth. Since a deductive argument is only valid when the premises entail the conclusion—a condition not met by these last two examples of mixed-conditional syllogisms. Any argument of this form is invalid because the form commits the fallacy of affirming the consequent. Compare modus ponens to affirming the consequent:

<table>
<thead>
<tr>
<th>modus ponens</th>
<th>fallacy of affirming the consequent</th>
</tr>
</thead>
<tbody>
<tr>
<td>If antecedent then consequent</td>
<td>If antecedent then consequent</td>
</tr>
<tr>
<td>antecedent</td>
<td>consequent</td>
</tr>
<tr>
<td>consequent</td>
<td>antecedent</td>
</tr>
</tbody>
</table>

Study Hint

Modus ponens is always valid; affirming the consequent never is.

Besides modus ponens, another valid form—modus tollens—of mixed-conditional syllogism denies the consequent as its second premise and denies the antecedent as its conclusion. Here's an example:

If we begin recycling efforts immediately, we have a good chance of saving the environment.
We don't have a good chance of saving the environment.
We're not beginning recycling efforts immediately.

We can compare the forms of modus ponens and modus tollens as follows:
modus ponens

If antecedent then consequent
antecedent
consequent

modus tollens

If antecedent then consequent
not consequent
not antecedent

To help see that arguments of this form, known as modus tollens, are valid, consider this simple instance:

If my car is safe to drive, then it has good brakes.
My car does not have good brakes.
My car is not safe to drive.

Just as we have to be wary of confusing modus ponens with the fallacy of affirming the consequent, we must be careful not to confuse modus tollens with the fallacy of denying the antecedent. Here's an example of the fallacy of denying the antecedent:

If my car is safe to drive, then it has good brakes.
My car is not safe to drive.
My car does not have good brakes.

Based only on the premises, the conclusion “my car does not have good brakes” does not follow. The conditional relationship asserts only that it is not possible for the antecedent to be true and the consequent false. In other words, the occurrence of the antecedent guarantees the occurrence of the consequent. This relationship only goes in one direction. We cannot, for example, reverse the antecedent and consequent and retain the original conditional relationship. “If my car is safe to drive, then it has good brakes” is not equivalent to “If my car has good brakes, then it is safe to drive.” Yet this is exactly what the fallacy of denying the antecedent assumes. Compare modus tollens and the fallacy of denying the antecedent to see how these clearly differ:

modus tollens

If antecedent then consequent
not consequent
not antecedent

fallacy of denying the antecedent

If antecedent then consequent
not antecedent
not consequent

Pure Conditional Syllogism

Sometimes, a conditional syllogism contains only conditional propositions, for example:

If Lisa has nightmares, then Nicky wakes up.
If Nicky wakes up, then Lina goes bonkers.
If Lisa has nightmares, then Lina goes bonkers.
Since the syllogism contains only conditional propositions, we call it a pure conditional (or hypothetical) syllogism. Note three things about this particular argument that make it—and any argument with the same form—valid:

1. The consequent of the first premise is the same as the antecedent of the second premise;
2. the antecedent of the first premise is the same as the antecedent of the conclusion; and
3. the consequent of the second premise is the same as the consequent of the conclusion.

We can use the following abbreviated arguments to represent the form of valid pure conditional syllogisms. (1, 2, 3, X, Y, and Z represent any statements whatsoever.)

\[
\begin{align*}
\text{If } & 1 \text{ then } 2 & \text{If } X \text{ then } Y & \text{If } 1 \text{ then } Z \\
\text{If } & 2 \text{ then } 3 & \text{If } Y \text{ then } Z & \text{If } Z \text{ then } X \\
\text{If } & 1 \text{ then } 3 & \text{If } X \text{ then } Z & \text{If } 1 \text{ then } X
\end{align*}
\]

Any pure conditional syllogism of this form is valid; if it does not follow this form it is invalid.

**EXERCISE 10–2**

Determine which—if any—of the following conditional syllogisms are valid.

1. If the Vice-President was not guilty of wrongdoing, he would not resign from office.
   The Vice-President did resign from office.
   Therefore the Vice-President was guilty of wrongdoing.

2. If there's life in outer space, it's superior to us.
   If it's superior to us, it will contact us.
   If there's life in outer space, it will contact us.

3. If a thing precedes itself, it is its own cause.
   A thing cannot precede itself.
   Thus a thing is not its own cause.

4. If this is Brussels, today is Tuesday.
   Today is not Tuesday.
   Therefore this is not Brussels.

5. If a President is impeached, then no one benefits.
   A President is impeached.
   Then no one benefits.
6. If the witness is either the criminal or the criminal's accomplice, he'll lie.
The witness is neither the criminal nor the criminal's accomplice.
Therefore, he'll not lie.

7. If Joanne knows what she's talking about, I'm a monkey's uncle. And since I'm obviously not a monkey's uncle, Joanne doesn't know what she's talking about.

8. If taxes rise, consumer purchases decline. If consumer purchases decline, the economy suffers. If taxes rise, the economy suffers.

9. If the President knows what he's doing with this Gulf War thing, I'm not your wife. Since you're my husband, the President doesn't know what he's doing with this Gulf War thing.

10. If Harry goes to town on payday, he'll come home broke. Harry comes home broke, so we can conclude that he goes to town on payday.

THE DILEMMA

Most of us have probably found ourselves "between a rock and a hard place," faced with "choosing the lesser of two evils." There are times when we'd like to avoid either of the only alternatives open to us. Perhaps you've waited until the last minute to prepare for your Cosmetology 1A final. You've planned to study this weekend—and then the boss calls and says you have to work overtime or be fired. You need the job to pay for next term's tuition, but if you fail Cosmetology 1A you won't be allowed back in school anyway. You've got a dilemma.

In logic, a dilemma is a very specific argument form. A dilemma is a syllogism that contains a conditional and disjunctive premise, and either a simple statement or a disjunction for its conclusion. A simple dilemma contains a simple statement for its conclusion; a complex dilemma contains a disjunction for its conclusion.

To illustrate a simple dilemma, let's look at the structure of a simple dilemma many students feel themselves confronted with:

If I don't go to the party with my best friend and have fun, I'll feel guilty; if I don't stay home and study, I'll feel guilty.
Either I go to the party or I study.
Therefore I'll feel guilty.

If we let p, q, and r stand for any of three different propositions, we can represent the form of a valid simple dilemma like this:

\[
\text{If } p \text{ then } q \text{ and If } r \text{ then } q \\
p \text{ or } r \\
q
\]
We notice that a simple dilemma combines two instances of *modus ponens*:

\[
\begin{align*}
\text{If } p \text{ then } q & \quad \text{If } r \text{ then } q \\
\hline
p & \quad r \\
q & \quad q
\end{align*}
\]

Any argument of this form is valid.

Now let's look at an example of a complex dilemma:

- If I get married, then I lose my freedom; if I stay single, then I am lonely.
- I either get married or stay single.
- Therefore I either lose my freedom or I am lonely.

The basic form of this argument—and of any valid complex constructive dilemma—is

\[
\begin{align*}
\text{If } P \text{ then } q & \quad \text{and if } r \text{ then } s \\
\text{Either } p & \quad \text{or } r. \\
\text{Either } q & \quad \text{or } s.
\end{align*}
\]

Any *complex constructive dilemma* of this form is valid; otherwise it is invalid.

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**Study Hint**

Simple dilemmas contain simple statements as conclusions; complex dilemmas contain disjunctions as conclusions.

Our example of a complex dilemma illustrates an important point: The frustration we so often feel when confronted with an apparent dilemma is usually compounded by the fact that most of the dilemmas we encounter in our daily dealings are valid. So we often feel the frustration of being "caught on the horns of a dilemma." In fact, you may have noticed that the everyday use of the term *dilemma* is almost entirely confined to circumstances in which someone seems to be confronted with an inevitably unattractive outcome. There are times, as we'll see, when the inevitable isn't at all bad; but generally the dilemma poses an undesired and unpleasant conclusion.

The very sense of frustration and inescapability we feel in the presence of a valid dilemma makes the dilemma a powerful tool in making a case. We are understandably often reluctant to take difficult action. Consider the case of a state legislator trying to convince the governor to increase the education budget. If our legislator can formulate his case as a dilemma, he will have effectively limited the governor's options. This may compel the governor to see things his way. Let's see how.

The legislator might, for example, argue that there are only two places in the budget left to cut: welfare or education. Having gotten this far, our legislator makes his case: "The registrar of voters reveals that there are 200,000 registered voters on
welfare. Four million registered voters have children in school. If you cut funds from welfare, you risk alienating 200,000 voters. If you cut funds from education, you risk alienating 4 million voters. You must either cut funds from welfare or education. Therefore, you must alienate either 200,000 voters or 4 million voters.”

Although the legislator’s dilemma may not be cogent, it is valid. If he has presented it in a persuasive manner, the governor may very well feel there are only these two alternatives. That’s what the legislator hopes. When simple and complex dilemmas deviate from valid form, they present no problem of rebuttal. We simply can dispose of them as being invalid. But what about dilemmas that are valid? What can we do to avoid being impaled on the horns of simple and complex dilemmas?

As is true of any valid argument, before accepting it as cogent we should examine its premises for truth. There are two ways to challenge the truth of dilemmas. One is to take the dilemma by the horns; the other is to escape between the horns. Let’s illustrate what we mean by focusing on the student’s argument.

By “taking the dilemma by the horns,” we mean attacking the truth of the conditional premise. Respecting the student’s dilemma we can ask, Why are studying and having fun mutually exclusive? Can’t studying be fun? In fact, the best kind of learning takes place when we’re enjoying what we’re studying—when we’re “having fun.” The point is that if we successfully attack one of the conditionals (by perhaps showing that it is a false cause fallacy or a hasty conclusion), we destroy the dilemma it sets up.

On the other hand, rather than attacking the conditional proposition, we might “escape between the horns” of the dilemma by attacking the disjunction. Thus, perhaps we can be both studious and idle. Surely there are times when the mind must turn away from intense work to restore itself for more work. Undoubtedly, a healthful combination of study and idleness—rest and relaxation—is the best guarantee of success. Reasoning in this way, we in effect contend that the disjunction poses a false dilemma, an either/or situation where, in fact, none exists. If our contention is correct, we destroy the disjunction and the dilemma with it.

Taking a dilemma by the horns or escaping between the horns are the best ways to refute a dilemma. There is a third way, however, that is marvelously entertaining, though usually inadequate to the task.

The Counterdilemma

A counterdilemma is a dilemma whose conclusion is opposed to the conclusion of the original. Ideally the counterdilemma should contain the same propositions as the original dilemma. A celebrated lawsuit between the ancient Greeks Protagoras and Eulathus provides a classic example of such a counterdilemma and how rhetorically devastating it can be.

Protagoras was a fifth-century BC teacher who specialized in pleading cases before juries. Eulathus was his student. Lacking the required tuition for his training, Eulathus arranged with Protagoras to defer payment until he, Eulathus, won his first case. Unfortunately for Protagoras, Eulathus delayed going into practice after he finished his training. Fed up with waiting for his money, Protagoras decided to sue
his former student for the tuition. At the beginning of the trial, Protagoras posed his case in the form of a dilemma:

If Eulathus loses this case, then he must pay me (by judgment of the court); if he wins this case, then he must pay me (by terms of the contract). He must either lose or win this case. Therefore Eulathus must pay me.

What could be harder to imagine than Eulathus' avoiding the horns of this dilemma? As unpromising as his situation seemed, Eulathus was nonetheless up to it; evidently he had learned his rhetorical lessons well. He offered the court a counterdilemma:

If I win this case, I shall not have to pay Protagoras (by judgment of the court); if I lose this case, I shall not have to pay Protagoras (by the terms of the contract, for then I shall not yet have won my first case). I must either win or lose this case. Therefore, I do not have to pay Protagoras!

Notice that the beauty of Eulathus' counterdilemma is that its conclusion explicitly denies the conclusion of Protagoras' dilemma. Genuinely to rebut a dilemma requires such an explicit denial in the conclusion. When it occurs, the counterdilemma is most effective. But rarely do we come across such counterdilemmas. More often than not, the counterdilemma, although enormously crowd pleasing, logically does nothing to refute the dilemma.

To illustrate an entertaining but logically inert counterdilemma, let's again dip into Greek history. An Athenian mother who was attempting to persuade her son not to enter politics is said to have argued,

If you say what is just, men will hate you; and if you say what is unjust, the gods will hate you; but you must either say the one or the other; therefore you will be hated.

To which her son replied,

If I say what is just, the gods will love me; and if I say what is unjust, men will love me. I must say either the one or the other. Therefore I shall be loved!

Although such a counterargument is extremely clever and bound to win many debating points, its conclusion is not an explicit denial of the dilemma's conclusion. Recall the Protagoras–Eulathus debate. Protagoras' conclusion was "Eulathus must pay me." Eulathus' conclusion was "I do not have to pay Protagoras." These two statements are incompatible; to accept one is to deny the other; one is the contradiction of the other. But believe it or not, the Athenian youth's conclusion, "I shall be loved," is not incompatible with his mother's conclusion, "You will be hated." The reason is that the mother is, in effect, concluding, "You will be hated by men or by the gods." And the son, in effect, is concluding, "I shall be loved by the gods or by men." Since the son could end up being hated by men and loved by the gods, or hated by the gods and loved by men, the conclusions of mother and son are perfectly compatible. The son has not refuted his mother's argument. He'd be much better served to attack the horns of its dilemma or try to escape between its horns. And thus we all would when faced with a dilemma.
But daily, as politicians and advertisers prove, we are taken in by flashy rhetorical devices. And the counterdilemma can be one of them. Not only can the counterdilemma win over an audience, it can even convince arguers that their shrewdly constructed dilemmas are unsound. Consider this example:

Lloyd thought he had Dean right where he wanted him. He had loaned Dean twenty dollars to bet on a horse, and according to their agreement, Dean either owed him twenty dollars or a share of the winnings. Maybe so. But with uncommon deftness, Dean counterattacked. He posed a counterdilemma of essentially this form:

If the horse wins, then I don't owe you the twenty dollars (for in that event, I'd owe you a share of the winnings); if the horse loses, then I don't owe you a share of the winnings (because obviously there would be no winnings).

Either the horse wins or loses.

Either I don't owe you the twenty dollars or I don't owe you a share of the winnings.

And then, with a flourish of his hand, he added, "Either way we're even." Whereupon Lloyd did what any rational person would do under the circumstances: He threatened to rip Dean's beard off if he didn't get his money back.

**EXERCISE 10–3***

Determine the validity of the following dilemmas. If invalid, refute by either taking the dilemma by the horns or by escaping between the horns. Construct a counterdilemma for each original dilemma.

1. If the speech is just informative, it will bore me; if it is just entertaining, it will not educate me.
   The speech will be either informative or entertaining.
   Therefore the speech will either bore me or not educate me.

2. If there is a God, he will reward me for my virtuous deeds; if there is no God I will sleep a peaceful, uninterrupted sleep.
   There is either a God or there is not.
   Thus I will either be rewarded for my virtuous deeds or I will sleep a peaceful, uninterrupted sleep.

3. If she rejects me, I'll be crushed; if she accepts me, I'll be terrified.
   She'll either reject me or accept me.
   I'll be either crushed or terrified!

4. If the United States modifies its Middle East position, it will offend a good many American Jews; if the United States does not modify its Middle East position, it will jeopardize its fuel supplies in Arab countries.
   The United States must either modify its position in the Middle East or not.
   As a result, the United States will either offend a good many American Jews or jeopardize its fuel supplies in Arab countries.
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5. If I study my logic tonight, then I will not get to go to the movies; if I don't study my logic tonight, I will worry.
   I either study my logic tonight or I don't.
   I either don't get to go to the movies or I worry.

6. If I vote, then I must choose between two evils. If I don't vote, then I am not a good citizen.
   Either I vote or I don't.
   So either choose between two evils or I am not a good citizen.

7. If I pay my rent, then I can't pay my utilities and they will be turned off. If I don't pay my rent, then I will be evicted.
   I either pay my rent or I don't.
   I am either evicted or they turn off my utilities.

8. If I get married, I lose Midge; if I don't get married, then I lose Louise.
   Either I get married or I don't.
   I lose either Midge or Louise.

9. If I tell the truth, you will be angry with me; if I lie, I will be angry with myself.
   I either tell the truth or I lie.
   One or the other of us is angry with me.

10. If I keep this old clunker, I must spend a fortune on repairs; if I buy a new car, then I must spend a fortune on payments and insurance.
    Either I keep this old clunker or I buy a new car.
    Either I spend a fortune on repairs or I spend it on payments and insurance.

SUMMARY

In this chapter we learned how to recognize some common deductive syllogisms. We learned that:

A disjunction is a compound proposition that asserts that at least one of its disjuncts is true. The alternatives that compose a disjunction are called disjuncts. A disjunction is true if either of its disjuncts is true, and it is true if both of its disjuncts are true. The only time a disjunction is false is if both of its disjuncts are false.

Valid disjunctive syllogisms contain a disjunction as one premise, the negation of one of the disjuncts as the second premise, and the affirmation of the remaining disjunct as the conclusion. The basic form of valid disjunctive syllogisms looks like this:

\[
\text{Either } p \text{ or } q \\
\text{not } p \\
q
\]
Invalid disjunctive syllogisms look like:

Either \( p \) or \( q \)

\[
\begin{align*}
\text{Either } p & \quad \text{or } q \\
p \quad & \quad \text{or} \\
\text{not } q & 
\end{align*}
\]

We also learned about hypothetical or conditional propositions and syllogisms. A hypothetical proposition is a compound proposition that asserts a conditional relationship between two other propositions, expressed in if . . . then form. The proposition that occurs between if and then is called the antecedent of the conditional, and the proposition that follows then is known as the consequent. A hypothetical proposition is true if and only if the consequent is not false when the antecedent is true. The only time a hypothetical proposition is false is when the antecedent is true while the consequent is false.

Modus Ponens and Modus Tollens are two forms of valid mixed-conditional syllogisms. When the second premise of a mixed-conditional syllogism affirms the antecedent of the conditional premise and the conclusion affirms its consequent, the syllogism is a valid instance of modus ponens. When the second premise of a mixed-conditional syllogism denies the consequent of the conditional premise and the conclusion denies its antecedent, the syllogism is a valid instance of modus tollens.

We can illustrate the form of modus ponens and modus tollens as follows:

<table>
<thead>
<tr>
<th>modus ponens</th>
<th>modus tollens</th>
</tr>
</thead>
<tbody>
<tr>
<td>If antecedent then consequent</td>
<td>If antecedent then consequent</td>
</tr>
<tr>
<td>antecedent</td>
<td>not consequent</td>
</tr>
<tr>
<td>consequent</td>
<td>antecedent</td>
</tr>
</tbody>
</table>

We distinguished between two fallacies that superficially resemble modus ponens and modus tollens. Structurally they compare as follows:

<table>
<thead>
<tr>
<th>modus ponens</th>
<th>fallacy of affirming the consequent</th>
</tr>
</thead>
<tbody>
<tr>
<td>If antecedent then consequent</td>
<td>If antecedent then consequent</td>
</tr>
<tr>
<td>antecedent</td>
<td>consequent</td>
</tr>
<tr>
<td>consequent</td>
<td>antecedent</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>modus tollens</th>
<th>fallacy of denying the antecedent</th>
</tr>
</thead>
<tbody>
<tr>
<td>If antecedent then consequent</td>
<td>If antecedent then consequent</td>
</tr>
<tr>
<td>not consequent</td>
<td>not antecedent</td>
</tr>
<tr>
<td>antecedent</td>
<td>not consequent</td>
</tr>
</tbody>
</table>

Lastly, we studied two kinds of dilemma. A dilemma is a syllogism that contains a conditional and disjunctive premise, and either simple or compound statement for its conclusion. A simple dilemma contains a simple statement for its conclusion; a complex dilemma contains a disjunction for its conclusion.
A valid simple dilemma looks like this:

\[
\begin{align*}
\text{If } p & \text{ then } q \\
\text{and if } r & \text{ then } q \\
\text{p or r} & \quad \Rightarrow \\
\text{q} &
\end{align*}
\]

A valid complex dilemma looks like this:

\[
\begin{align*}
\text{If } p & \text{ then } q \\
\text{and if } r & \text{ then } s \\
\text{p or r} & \quad \Rightarrow \\
\text{q or s}
\end{align*}
\]

We learned to refute dilemmas with counterdilemmas, as well as by taking a dilemma by the horns by attacking the truth of its conditional premise. We learned to escape between the horns of a dilemma by attacking the disjunction.

**ADDITIONAL EXERCISES**

Determine the validity of the following. Identify any fallacies that may be present. Name the form of each argument.

1. Bush either forgot that he promised no new taxes, or he lied. He didn’t lie, so he must have forgotten.

2. If secular humanism is a religion, then it should not be taught in public schools. But secular humanism is taught in public schools, so it must not be a religion.

3. If I study for my logic final, then I’ll lose my sweetheart. If I lose my sweetheart, then my life’s empty and futile. If I study for my logic final, my life’s empty and futile.

4. If I go to the movies, then I enjoy myself; if I stay home, then we have fun together. I’m either going to the movies or I’m not, so I’ll either enjoy myself or we’ll have fun together.

5. God either exists or I’m a fool. God exists. Therefore I’m not a fool.

6. If you think De Niro’s a better actor than Stallone, then I’m a nitwit, and I ain’t no nitwit!

7. If you love me, then you give me gifts. You give me gifts, so I know that you love me.

8. If I love you, then I want to marry you. But I don’t love you, so I don’t want to marry you.
If it rains, the crops will die; if it doesn't rain, the stock will die. Either the crops will die or the stock will die, since it either rains or it doesn't.

10. If this is question 10, then we're through with this exercise. We're not through with this exercise, so this isn't question 10.