

**The Little Logic Book**  
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*Exercises for The Little Logic Book may be downloaded by the instructor as Word documents and then modified for distribution to students; or students may be instructed to download the exercises and then told which ones to answer. This is an exercise bank; it is not assumed that students will do all the exercises for any one chapter. Comments, questions or suggestions for Chapter One of The Little Logic Book can be sent to [logic@calvin.edu](mailto:logic@calvin.edu)*

**Exercise Bank for Chapter One:**  
**Deductive Logic**  
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**1.0 Arguments, Descriptions and Explanations**

Arguments are sets of statements consisting of both a conclusion and premises intended to support the conclusion. Typically, arguments are given in order to convince us that something is the case. Not all sets of statements, however, are arguments. Descriptions, for instance, are given to tell us *what* is the case. Explanations are intended to tell us *why* something is the case. In arguments we try to establish *that* something is the case. Consider the brief paragraphs below. Among them are descriptions, explanations and arguments. Which ones are descriptions; which ones are explanations; which ones are arguments? In the paragraphs you identify as arguments, which statement counts as the conclusion?

1.1 I flew from Detroit to London last summer. I landed at Gatwick Airport and then took the Gatwick Express train to Victoria Station. From the Victoria Station I took the Victoria subway line up to the Highbury/Islington stop. The B&B was just a ten-minute walk from there.

1.2 Yes, officer, I stayed at a B&B in Highbury last night. Here is my room reservation and my receipt. I could even give you a detailed description of the receptionist if you like. Surely I couldn't provide you with all this stuff if I didn't stay there, right?

1.3 My keys are not in my pocket. They're not in my shoulder bag. I must have left them back at my room in the B&B.

1.4 I'm sorry I'm late. But the Victoria line was closed for repairs today. I had to take a longer route with a transfer to get here. So I'm late.

1.5 I took a long walk on the Hampstead Heath today. The sky was clear. There was a light breeze from the west. The leaves were starting to turn. From the top of the heath we could see the city of London spread out before us under the setting sun.

1.6 I always feel lousy after eating anything with MSG in it. I feel pretty lousy right now. That lunch spot off of Covent Garden must have used MSG in its food.

1.7 Since I had lunch at a Chinese restaurant by Covent Garden with lots of MSG in it, I feel pretty lousy right now. I'm allergic to MSG.

1.8 I wanted to get down to Lincoln's Inn Fields to see Sir John Sloan's Museum. I heard he kept a sarcophagus in the basement. But I didn't get there. Long Acre Street had so many interesting shops in it, by the time I got to Drury Lane I just didn't have enough time.

1.9 We have time to see either St. Paul's Cathedral or the Tate Modern, but not both. So if we see St. Paul's we'll have to forego the Tate.

1.10 We saw Covent Garden, walked along Long Acre Street where all the shops are, and then took the subway from Holborn over to St. Paul's. The visit to St. Paul's Cathedral was the conclusion of our day in London.

## **2.0 Basic Concepts**

Define or identify the following:

- 2.1 Argument
- 2.2 Premise
- 2.3 Conclusion
- 2.4 Valid
- 2.5 Invalid
- 2.6 Sound
- 2.7 Form
- 2.8 Hypothetical syllogism
- 2.9 Modus ponens
- 2.10 Modus tollens
- 2.11 Disjunctive syllogism
- 2.12 Constructive dilemma
- 2.13 Destructive dilemma
- 2.14 Affirming the consequent
- 2.15 Denying the antecedent
- 2.16 Enthymeme
- 2.17 Inference
- 2.18 Inductive argument
- 2.19 Deductive argument

## **3.0 Symbols and Connectives**

Write the symbols for:

- 3.1 and
- 3.2 not
- 3.3 either ... or
- 3.4 if ... then
- 3.5 if and only if
- 3.6 therefore

## **4.0 Validity and Soundness**

Indicate whether the followings statements are true or false. Briefly explain your answers.

- 4.1 Any argument that has a false conclusion is invalid.
- 4.2 No argument that has a false premise is sound.
- 4.3 Any argument with all true premises and a true conclusion is valid.
- 4.4 Some arguments with false premises and false conclusions are nonetheless valid.
- 4.5 If the premises of an argument are all false and the argument is invalid, then the conclusion will always be false as well.
- 4.6 If several arguments all have the same form, then either all of them are valid or all of them are invalid.
- 4.7 Any argument with a conclusion that cannot under any possible circumstance be false will be a valid argument regardless of what the premises are.
- 4.8 Having all true premises and a true conclusion does not guarantee that an argument is sound.
- 4.9 Any argument that is valid and has all true premises also has a true conclusion.
- 4.10 Any argument that is valid and has a true conclusion has at least one true premise
- 4.11 Any argument that is valid and has at least one false premise has a false conclusion.
- 4.12 Any argument that is valid and has a false conclusion has at least one false premise.
- 4.13 Any argument that is invalid and has a false conclusion has at least one true premise.
- 4.14 Any argument that is invalid and has a true conclusion has at least one false premise.
- 4.15 Any argument that is invalid and has at least one true premise has a false conclusion
- 4.16 Any argument that is invalid and has at least one false premise has a true conclusion.
- 4.17 Any argument with all false premises and a false conclusion is invalid.

## 5.0 Evaluating Arguments

5.1 What two key questions must be asked in evaluating any argument?

5.2 In *The Consolation of Philosophy*, written around 525 AD, philosophy is personified in the form of a woman. She visits the author, Boethius, in his prison cell awaiting execution. In the course of their conversation she reminds him of the basic method of evaluating arguments. Explain what she has to say here in terms of the *validity* and *soundness* of deductive arguments.

“If someone thinks a particular conclusion hard to accept, he ought to show either that some false assumption has preceded it or that the way the arguments have been marshaled does not necessarily produce the conclusion. Otherwise, provided he agrees to what has preceded, there is absolutely no ground for disputing the conclusion.” (*The Consolation of Philosophy*, Penguin Books edition, p. 97; translation modified)

## 6.0 Logic and Rhetoric

6.1 What is the primary focus of logic?

6.2 Arguments that have true premises and a valid logical form may nonetheless fail to convince. Give at least two reasons why that may happen.

## 7. Deductive Forms

7.1 Constructive dilemma is to modus ponens as destructive dilemma is to \_\_\_\_\_.

7.2 If one switches the second premise and the conclusion of the form of disjunctive syllogism that is valid only in the exclusive sense, is the resultant argument also valid in the exclusive sense? Explain your answer.

7.3 If told that the following is *valid*, what can be inferred about the meaning of “or” in the first premise?

Either A is true or B is true  
A is true  
Therefore,  
B is not true.

7.4 Represent the following statements in symbolic form, using letters for simple statements and symbols for the connectives.

7.4.1 My brother is not feeling good, and I am not feeling so good myself.

7.4.2 It's not raining today.

7.4.3 If it's raining today, the sidewalks will be wet.

7.4.4 Either it's going to rain today, or it's going to snow.

7.4.5 Yeah, I'm going to the movies with Josiah if and only if he's paying for both of us.

7.5 Make up English sentences that represent the following logical forms.

7.5.1  $P \rightarrow Q$

7.5.2  $\sim P$

7.5.3  $P \vee Q$

7.5.4  $P \wedge Q$

7.5.5  $P \equiv Q$

7.6 For each of the following, (a) *name* the form and (b) *indicate* whether the argument is valid or invalid.

7.6.1  $A \rightarrow B$   
A  
 $\therefore B$

7.6.5  $\sim A \rightarrow \sim B$   
 $\sim B$   
 $\therefore \sim A$

7.6.2  $A \rightarrow B$   
B  
 $\therefore A$

7.6.6  $\sim A \rightarrow \sim B$   
 $\sim A$   
 $\therefore \sim B$

7.6.3  $A \rightarrow B$   
 $\sim A$   
 $\therefore \sim B$

7.6.7  $A \vee B$   
A  
 $\therefore \sim B$

7.6.4  $A \rightarrow B$   
 $\sim B$   
 $\therefore \sim A$

7.6.8  $A \rightarrow B$   
 $C \rightarrow D$   
 $\sim B \vee \sim D$   
 $\therefore \sim A \vee \sim C$

7.7 For each of the following arguments (a) *state* the form of the argument in symbols (b) *name* the form of the argument (c) *indicate* whether the argument is valid or invalid.

7.7.1 If the corporation were planning a takeover bid, one would expect them to be quietly accumulating proxies for the next stockholders' meeting. They have, however, shown no signs of collecting proxies, so they must have no plans.

7.7.2 If people didn't understand the importance of the issue, they naturally would not be upset by the present turn of events. The fact that they are not upset just demonstrates how ignorant people really are.

7.7.3 If you do not do well on this section of the exam, things don't look good for your exam grade. Fortunately, you seem to be doing splendidly on these syllogisms, so your exam grade should be pretty good.

7.7.4 If he is completely without regrets, that means that he did nothing he should not have done. But he does have regrets, since he did do something he should not have done.

7.7.5 If I eat too much tonight, then I'll feel really sick. But I didn't eat too much tonight. So I won't feel sick.

7.7.6 If it rained, the sidewalks outside will be wet. The sidewalks outside are wet. Therefore, it must have rained.

7.7.7 Pacifism might be a wonderful policy if everyone would adhere to it. But since not everyone will, it wouldn't be.

7.7.8 If we tell Zack our secret, Paul's going to give it away. I just know it. Because if we tell Zack our secret, he'll turn around tell it to Paul. And if Paul is told the secret, he'll give it away. I don't like it, but that's the way it is.

7.7.9 Either the next president of the United States will be a Republican or the next president of the United States will be a Democrat. If the next president of the United States is a Republican, then we'll have lower taxes. If the next president of the United States is a Democrat, then we'll have higher taxes. So, no doubt, we'll have either lower or higher taxes.

7.7.10 If blug, then glibbet. Blug (obviously). So—surprisingly enough—glibbet.

These next few examples will require some careful thinking:

7.7.11 He'll either do something regrettable or he'll go to the party. So since he's going to the party we can all relax—he'll do nothing regrettable.

7.7.12 We all knew that that entry would win only if the judges were incompetent. It did, so they must have been.

7.7.13 Unless we get toxic waste dumping under control, we face increased levels of disease. But there is virtually no chance of stopping polluters from pouring toxins into the environment, so we must brace for rising numbers of disease cases.

7.7.14 Regrets are inescapable, since if he goes he'll do something regrettable, and if he stays home—and that's his only other option—he'll regret spending the evening alone.

7.7.15 If this medication really was effective, then we would have seen a much higher cure rate than the 8% we actually did see.

## 8.0 Evaluating Arguments for Validity and Soundness

8.1 Consider the following complex argument:

1. Either the Democrats or the Republicans will win the next presidential election.
2. If the Democrats win, then my crystal ball will be wrong.
3. But my crystal ball is never wrong!

4. So the Democrats won't win.
5. Therefore, the Republicans will win!

What kind of argument is made up of statements 1, 4 and 5? What kind of argument is made up of statements 2, 3 and 4? Are these argument forms valid or invalid? If they are both valid, do any of the premises strike you as at least questionable? If so, which one?

8.2 Consider the following argument:

1. Now if a good, all-powerful and all-knowing God exists, then there would be no evil in this world.
2. But there is evil in the world.
3. So a good, all-powerful and all-knowing God does not exist.

First determine whether this argument, by virtue of its logical structure, is valid. You are welcome to symbolize the argument in order to display its logical structure. If the argument is invalid, stop there—we already know the argument is bad. If you think the argument is valid, then examine the premises, indicating whether and why you think they are true or false. If the argument is valid, and both of the premises are true, then the argument is sound; if one or both of the premises are false, the argument is unsound.

## 9.0 Enthymemes

An enthymeme is an argument where one or more of the premises, or the conclusion, is left unstated.

9.1 Consider the following argument:

“This is a perfectly healthy meal,” your mother says. “So you should eat it.”

What's the missing premise?

9.2 In Chapter Two of *The Abolition of Man*, C.S. Lewis claims that a statement of fact like “This will preserve society” can never by itself lead to a command like “Do this,” unless it is joined by another premise. What might the missing premise be?

9.3 You propose to jump off a three-story building with homemade cardboard wings, expecting to fly. Your friend wants to dissuade from doing that, but says only one thing:

“That's crazy!”

What's the full argument here? What are the premises and the intended conclusion?

## 10.0 A Stretch: Deductive Argument in Philosophy

### 10.1 Morality and the Gods

Does it pay to be moral? This is one of the central questions explored in Plato's *Republic*, ostensibly the record of a dinner conversation that, judging by the size of the book, must have

lasted about sixteen hours. In the *Republic*, Socrates wants to know what justice is and whether being just is to our advantage. The Greek word that underlies the English term “justice” means more than just the laws of the land and their enforcement. It means something more like “righteousness” or “morality” or “doing the right thing.” Those who made an initial stab at defining justice in the opening book of the dialogue assumed that being just was to our advantage, although they disagreed on what kind of advantage it was. Cephalus, the host of the dinner, thinks being just is to our advantage because it guarantees that we will not be punished in the afterlife. His son Polemarchus thinks that being just is a kind of skill that will help us get ahead in this life. Then the big burly Thrasymachos steps forward and puts out a view he thought was much more realistic: Look, if you are powerful enough to get away with it, injustice is to your advantage. You take what you want, and no one can get back at you. You lay down the rules that everyone else has to obey—rules that work to your advantage. What we call justice is a matter of obeying the rules that the powerful people set up to their own advantage in a grand, overarching act of injustice. So practicing justice is never to your advantage, it’s to someone else’s advantage. If you’re strong enough you’d be a fool to obey the rules of justice. Rather, you’d practice injustice, enjoy its benefits, and get away with it scot-free.

Maybe. But we can imagine a person like Cephalus saying to himself: “Maybe you’d get away with it in this life. But what about the next life? Wouldn’t the gods know about your misdeeds and punish you accordingly? Maybe injustice is to your advantage in the short run. But it will eventually catch up with you, if not in this life, then in the next. In the long run, injustice is not to your advantage.”

In Book Two of the *Republic*, Adeimantus has an answer to this objection. He lays out three possibilities: either the gods don’t exist, or they do exist and they don’t care what we do, or they exist and they do care about what we do. If they don’t exist, we have nothing to worry about—we should go ahead and practice injustice if we can. If they do exist and don’t care what we do, we have nothing to worry about—we should go ahead and practice injustice if we can. Now if they do exist and do care about what we do, we still have nothing to worry about—we should go ahead and practice injustice if we can. Why? Well, the poets have told us about gods. They say that the gods can be persuaded by prayers and sacrifices. So, if the gods exist and do care about what we do, the gods can be persuaded by prayers and sacrifices; and if by putting on a big show in their honor we can persuade the gods not to punish us, then we have nothing to worry about—we should go ahead and practice injustice if we can.

The argument Adeimantus gives here is intended to be a deductive argument. See what you can make of it. Write it out in conventional form (watch out: it’s a complex argument!). Then try to represent its logical structure using symbols. Is the main argument valid or invalid? Is the sub-argument valid? If any part of the argument is invalid, where is the logical mistake? If valid overall, are there any premises that strike you as false or implausible?

## 10.2 The Morality of a Prison Break

Plato’s dialogue *Crito* represents Socrates’s conversation with one of his followers as Socrates awaited execution. The execution had been delayed until the end of a religious festival, marked by the return of a ship from the island of Delos. Meanwhile, escape from prison seemed like a real possibility, and his followers wanted to convince Socrates that he should do so. But Socrates would agree to escape only if he could be convinced that it was morally right to do so. Socrates imagines what the laws and the state would say to him about escaping from prison. He finds their argument convincing and thinks Crito should be similarly convinced.

Here is the basic argument of the laws and the state represented in conventional form. Given the six premises, you will have to make explicit the sub-argument that gets you to the antecedent of premise 6 so that you can draw the conclusion in line 7. Symbolize the overall argument. What are the deductive inferences employed in the sub-argument? What is the inference employed in the main argument? Are they valid? Do any of the premises strike you as false?

1. If you break an agreement, you do something morally wrong.
2. If you have been content with the laws of Athens your entire life, then you have implicitly agreed to keep those laws.
3. If you have implicitly agreed to keep those laws, then if you do what is forbidden by the laws, you break an agreement.
4. If you escape from prison after having been sentenced by the court, you have done what is forbidden by the laws of Athens.
5. You have been content with the laws of Athens your entire life.
6. If it is true that if you escape from prison after having been sentenced by the court then you have done something morally wrong, then it is not right to escape.

Therefore,

7. It is not right to escape.

### 10.3 Does God Exist?

In the thirteenth century, Thomas Aquinas wrote the *Summa theologiae*, a reasoned summary and defense of Christian doctrine. The work is set up in debate format, following the standard practices of public disputation in those days. For each topic and point of doctrine, Aquinas considers arguments against the position he wants to hold (“Objections”) and then, after stating his position, offers arguments against them (“Replies”). In Question 2, on God’s Existence, Article 3, “Whether God Exists,” in the First Part of the *Summa*, Aquinas considers two arguments against the existence of God. Here is a paraphrase of the second argument:

It is superfluous to suppose that what can be accounted for by a few principles has been produced by anything more than those few principles. But it seems that everything we see in the world can be accounted for by principles that do not suppose that God exists. For all natural things can be reduced to one principle, which is nature; and all voluntary things can be reduced to one principle, which is human reason or will. Therefore, there is no reason to suppose that God exists.

Here is one way to represent the argument in conventional form:

1. If everything we see in the world can be explained by nature or human agency, then we need not suppose that God exists in order to explain everything we see in the world.
2. Everything we see in the world can be explained by nature or human agency.



3. If we need to suppose that God exists, then we need to suppose that God exists in order to explain everything we see in the world.

Therefore,

4. We need not suppose that God exists.

(Note that this is not an argument against God's existence in any direct sense, but rather against the need to *suppose* that God exists. By "we need not suppose that God exists" Aquinas probably means something like "we have no good reason to believe that God exists.")

Evaluate this argument. If it is valid, isolate and name the valid inferences. If it is invalid, indicate where the reasoning went wrong. If you think the argument is valid, consider the premises—do you think each one of them is true?