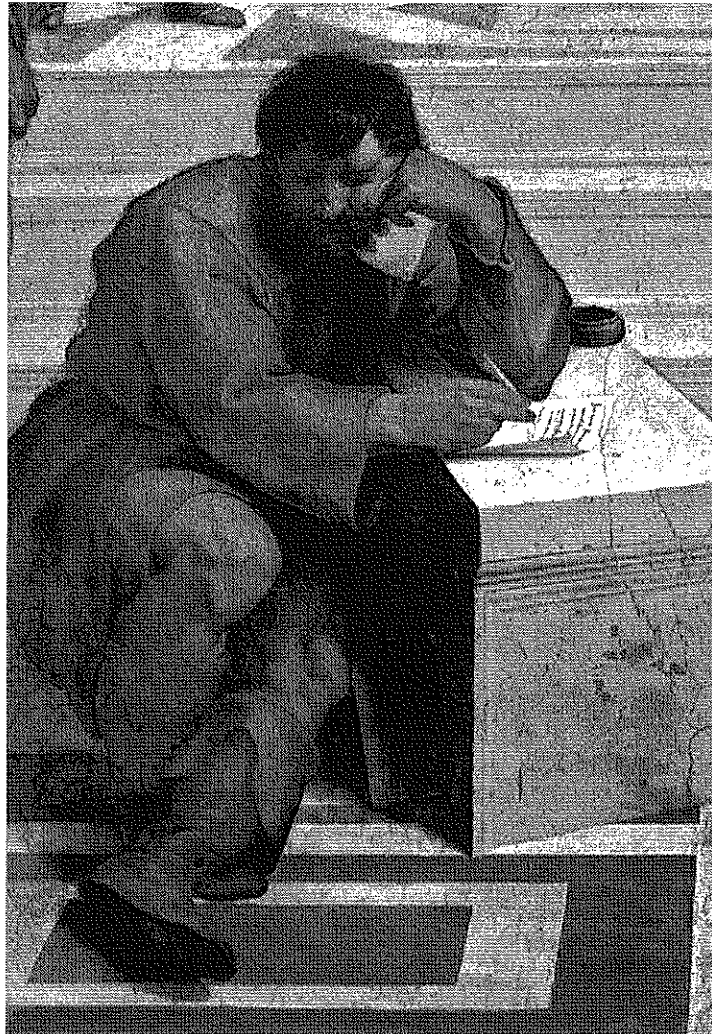


MATERIAL LOGIC

A Traditional Approach to Thinking Skills

BOOK I



Student Text

By Martin Cothran

CLASSICAL TRIVIUM CORE SERIES

MATERIAL LOGIC: BOOK I
A Traditional Approach to Thinking Skills
© 2006 by Martin Cothran
2nd Edition
ISBN: 978-1-930953-57-4

www.MemoriaPress.com

All rights reserved.
No part of this book may be reproduced in any form by
any means without written permission from the publisher.



Introduction..... 5
Year-at-a-Glance Schedule 8
Model Lesson Plan..... 9

Chapter 1: An Outline of Traditional Logic..... 11

Chapter 2: What is Simple Apprehension?..... 35

Chapter 3: Comprehension and Extension..... 41

The Ten Categories: The Division of Being According to Comprehension

Chapter 4: The Ten Categories 51
Chapter 5: The Eight Divisions of the Ten Categories 65
Chapter 6: The Three Uses of the Ten Categories 87

The Five Predicables: The Division of Being According to Extension

Chapter 7: The Essential Predicables..... 103
Chapter 8: The Accidental Predicables 121

Definition: The Expression of Comprehension

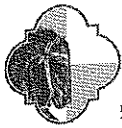
Chapter 9: What is Definition? 137
Chapter 10: Rules for Definition 149
Chapter 11: Analysis of "The Nature of Philosophy," by Fr. Vincent McNabb 159
Chapter 12: Analysis of "The Function of the Wise Man," by St. Thomas Aquinas..... 165
Chapter 13: Analysis of "What is Heresy?" by Hilaire Belloc..... 171

Division: The Expression of Extension

Chapter 14: Division..... 185
Chapter 15: Analysis of "Idols of the Mind," by Sir Francis Bacon..... 195

Appendices

Appendix A: How to Mark a Book..... 222
Appendix B: How to Define (with a Definition Worksheet)..... 223
Appendix C: How to Divide and Classify (with a Division Worksheet)..... 224



Introduction

Why This Book? When you begin to study a subject, it is always helpful to know two things: what it is you intend to study and why it is important to study it. With respect to what you are studying, you are studying a logic book. With respect to why it is important to study logic, it is important to know the truth, and logic is an instrument of truth. The problem is that many people—including many classical educators—do not know what logic is. Consequently, if you do not know what logic is, it is going to be very difficult to understand why you should study it.

Undoubtedly, this lack of understanding about the nature of logic is due in part to the lack of knowledge about what education is—or ought to be. Another part of the problem stems from a widespread misunderstanding of logic by educators themselves. Unfortunately, this is equally true of Christian educators—even those involved in the classical education movement. There are at least three respects in which logic is misunderstood by educators. The first has to do with the place of logic in the classical curriculum; the second has to do with the nature of logic itself; and the third concerns the difference between logic and other things that many times go under that title.

The Place of Logic in the Classical Curriculum. A couple of years ago, I read an article on classical education in a popular magazine. The article was written by one of the leaders of the classical Christian education movement. The author stated that, in following the classical trivium, students should study modern logic. I confess to being completely baffled by this statement. Of all the things a student should do in pursuing the classical trivium, one of the last would be modern logic. The problem is not that modern logic is not useful, or even that it isn't worth pursuing. The problem with modern logic is simply that it has little to do with the trivium.

The trivium is language study. Grammar, the first of the three components of the trivium, is the study of the structure of language and how that language is expressed in writing and speech. Rhetoric, the last part of the trivium, is the study of the rules of persuasion, as well as their written and spoken use. Logic fits in between these two, and is the study of the structure of thought and how that thought is expressed in words.

Modern logic, on the other hand, is largely mathematical. A course in modern logic (and I have taught it) would begin with the study of arguments as they are used in everyday language, but would terminate in the study of how to manipulate variable symbols. However, since words are not variable symbols like those studied in modern logic (which can stand for anything), but rather symbols that each have a particular signification, modern logic has limited use when it comes to the study of language.

When the liberal arts were consistently taught in schools, it was not modern logic that was studied, but traditional logic. In fact, the principles undergirding modern

There are three identifiable respects in which logic is misunderstood by educators.



systems of logic were not even formulated in a detailed manner until the 19th century. Yet it was not the lack of formulated principles, with respect to modern logic, that was the cause of the use of traditional logic in the liberal arts. Traditional logic was studied because traditional logic is a natural part of language study.

_____ **Is Logic Only Formal?** The second reason logic is misunderstood is that logic is identified almost exclusively with the system of formal logic. Many people, educators included, are simply not aware that there is any other aspect to logic. This is partly the result of the fact that modern logic has largely displaced traditional logic as the system of choice, and modern logic is exclusively formal. It studies the relations between statements and sometimes terms, depending on which modern system is used (there are several), in a way that makes the actual content of argumentation irrelevant. This is why modern logicians often say that the truth of a statement has little to do with logic. A traditional logician would never say this—at least without qualification.

_____ **What is the Difference between Logic and Critical Thinking Skills?** There is a third reason that logic is misunderstood. It is not just the onslaught of modern logic that has changed how we think about the discipline of logic: it is the way traditional logic itself has been taught during the last 200 years. Even though traditional logic includes both a formal and a material aspect—an emphasis on both the structure of arguments and their content—most traditional logic courses have simply ignored the branch of material logic. In the modern system, it is exclusively the structure, or form, of an argument that determines whether a conclusion follows from certain premises. The traditional system recognizes that logic is larger than just form, or structure, and that the content can and does affect the process of reasoning from premises to conclusion.

In one respect, we think of logic too narrowly, and in another, we think about it too broadly. While many people use the word ‘logic’ in a too-restricted sense in referring only to formal logic, many others associate it with any kind of abstract thinking. This also is a mistake, although a mistake in the opposite direction. I think the origin of this error lies in the contemporary emphasis on “critical thinking skills.” Although all logic is a part of critical thinking skills, all critical thinking skills are not a part of logic. The various discrete thinking processes studied in such programs range from spatial and figural skills, mathematical reasoning, as well as reading, writing, and vocabulary skills. Once again, these skills are not without value, but it would be a mistake to confuse them with logic itself. One striking fact about such programs, and one that brings us back to the content of the present book, is that they seem comprehensive but include almost nothing that is covered in traditional discussions of material logic, which is the emphasis of this book.

_____ **What Logic Is.** Logic is an art. Yet by saying this, we risk even more confusion. This is because the word ‘art,’ like the word ‘logic,’ has lost much of its meaning through careless use. We say that logic is an ‘art’ in the sense that Aristotle used the term: an organized, systematic discipline that is best taught in an organized, systematic way. And although material logic is not characterized by the overall structural consistency that characterizes formal logic, it is not unsystematic by any stretch of the imagination.

_____ **What is Material Logic?** Although I explain the place of material logic in the general scheme of philosophy in Chapter 1, I will briefly summarize that

Many people, educators included, are simply not aware that there is any other aspect to logic.



explanation here. There are two branches of logic. The first is *formal* logic, which we study in *Traditional Logic: Book I* and *Book II*, and the other is *material* logic, which we study in this book. The difference between the two is simply this: formal logic studies the *structure* of argumentation; material logic studies the *content* of argumentation. Because material logic is one of the two branches of logic, any complete course in logic must include a study of it.

Material logic is the forgotten sibling of formal logic, and few students currently encounter it in their schooling. This is ironic, since the skills studied in material logic are among the most useful thinking skills the student can acquire. Material logic studies how words are related to the ideas they signify, as well as how words can be used in relation to one another. It also studies how we can know the meaning of an idea and how that idea is related to other ideas it may include or that it may be included under.

We are creatures who spend the better part of our lives communicating with others—in the form of words. What we communicate with these words is ideas. Therefore, to know the relationship between words and ideas is crucial in order to understand how we communicate. It is also crucial in helping to develop the skill of communication, which we all use every day and in almost every circumstance.

Martin Cothran

Because material logic is one of the two branches of logic, any complete course in logic must include a study of it.



Week 1	Chapter 1	(Days 1-3 exercises)
Week 2	Chapter 1	(Days 4-6 exercises)
Week 3	Chapter 2	(Days 1-2 exercises)
	Chapter 3	(Days 1-2 exercises)
Week 4	Chapter 4	(Days 1-4 exercises)
Week 5	Chapter 5	(Days 1-3 exercises)
Week 6	Chapter 5	(Days 4-6 exercises)
Week 7	Chapter 6	(Days 1-4 exercises)
Week 8	Chapter 7	(Days 1-4 exercises)
Week 9	Chapter 8	(Days 1-4 exercises)
Week 10	Chapter 9	(Days 1-4 exercises)
Week 11	Chapter 10	(Days 1-3 exercises)
Week 12	Chapter 11	(Days 1-2 exercises)
	Chapter 12	(Days 1-2 exercises)
Week 13	Chapter 13	(Days 1-4 exercises)
Week 14	Chapter 14	(Days 1-4 exercises)
Week 15	Chapter 15	(Days 1-4 exercises)
Week 16	Chapter 15	(Days 5-8 exercises)



TEACHER PRESENTATION*

Main Idea of the Lesson: _____

A Division of the Main Idea of the Lesson: _____

A Presentation of Each of the Component Ideas: _____

ELICITING STUDENT RESPONSES

Definition & Division:

- Have students articulate the main idea in their own words
- Have students articulate the division of the main idea in their own words
- Have students articulate each of the component ideas in their own words

Identification:

- Have students identify examples of the main idea
- Have students identify examples of the component ideas

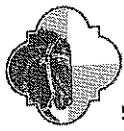
Application:

- Have students use ideas presented in the lesson

Synthesis:

- Have students create examples or illustrations of both the main and component ideas

*Although much of the above format is already incorporated into the exercises themselves, the teacher may be able to use it to design classroom instruction.



An Outline of Traditional Logic

Introduction. Logic is the art of reason. As Jacques Maritain said, logic “studies reason itself as an instrument of knowledge, or as a means of acquiring and possessing the true.” In order to understand logic better, let us look at the structure of philosophy, of which logic is a part. One way of understanding a concept better is to see where it fits in relation to some larger concept. We will do this with the concept of logic. The procedure of showing how a concept is a part of some larger, more general concept is called *division*. We will explain the rules of this procedure later in the book, but we perform it all the time.

Logic is one of the three branches of philosophy. The first branch of philosophy is *theoretical* philosophy, or philosophy proper. The sciences in this branch of philosophy are employed solely for the pleasure of knowledge. These include the philosophy of *mathematics*, which studies the being of things by virtue of their *quantity* (*ens quantum*); the philosophy of *nature*, which studies the being of things by virtue of their *sensible properties* (*ens mobile*), and finally, *metaphysics*, which studies the being of things by virtue of their *being* (*ens in quantum ens*). The formal object of theoretical philosophy is the *being* of things.

The second branch of philosophy is *practical* philosophy. While the object of theoretical philosophy is a knowledge of the first principles of the *theoretical* order, the object of the study of practical philosophy is a knowledge of the first principles of the *practical* order. These would include the philosophy of *art*, which has to do with man’s ability to make or create, and *ethics*, or *moral philosophy*, which has as its object the absolute good of man. The formal object of practical philosophy is *human acts*.

The field of philosophy is divided into theoretical philosophy, practical philosophy, and logic.

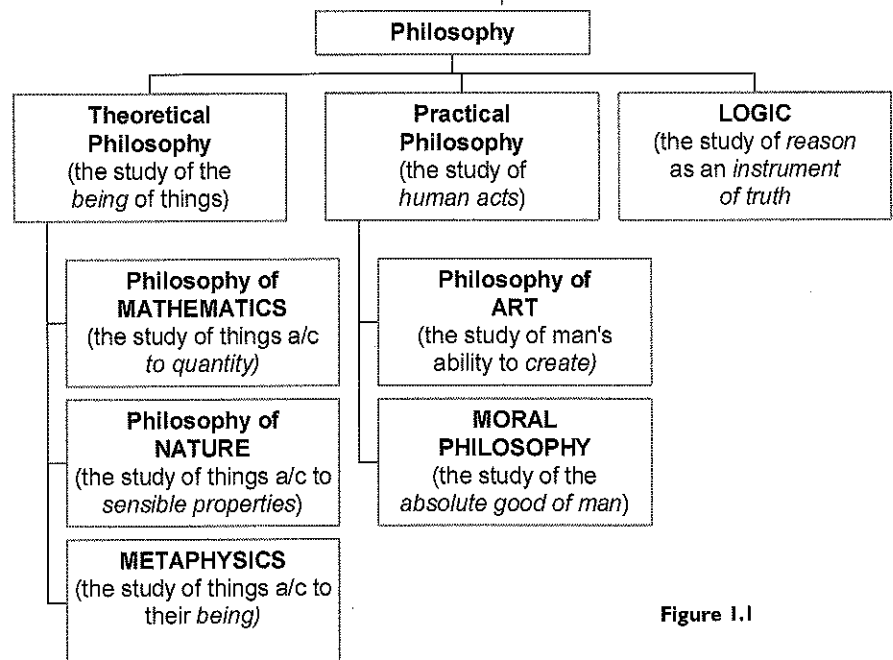


Figure 1.1



Logic is a third branch, although it is more properly considered to be the introduction to the rest of philosophy, since it provides the methods used in the other two branches. In this sense, logic is less a division of philosophy than the science or art of which the rest of philosophy makes use. Logic studies conceptual being (*ens rationis*) and directs the mind toward truth.

_____ **The Two Kinds of Logic.** At its most basic level, logic can be divided into *formal* and *material* logic. Formal logic is the branch of logic that studies the *form* or *structure* of arguments in order to see how reasoning proceeds from premises to a conclusion. Specifically, formal logic studies terms, propositions, and arguments in order to see more clearly how conclusions are derived from premises through deductive or inductive inference.

Many people associate logic exclusively with formal logic, but there is another branch of traditional logic called *material* logic. It does not deal with the form or structure of arguments, but rather with their *content*. While formal logic deals with how you get from one truth to another, material logic deals with the truths themselves. It studies terms, propositions and arguments in order to understand the *intelligible content* or *rational structure* of ideas.

For example, look at the following argument expressed in the form of a classical categorical syllogism:

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

From the perspective of formal logic, we would want to know whether the argument is valid. By this we mean that we would want to know whether the conclusion (“Socrates is mortal”) logically follows from the two premises (“All men are mortal” and “Socrates is a man”). From the perspective of material logic, we would want to know whether the argument is sound. Soundness involves not only the validity of an argument, but the truth of an argument’s premises. We would want to know, in other words, whether the two premises are really true, what the terms ‘men,’ ‘mortal,’ and ‘Socrates’ refer to and how, and many other things not directly related to the form of the argument.

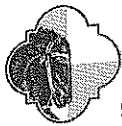
The distinction between these two branches of logic was nicely described by G. K. Chesterton:

Logic and truth ... have very little to do with each other. Logic is concerned merely with the fidelity and accuracy with which a certain process is performed, a process which can be performed with any materials, with any assumption. You can be as logical about griffins and basilisks as about sheep and pigs ... Logic, then, is not necessarily an instrument for finding out truth; on the contrary, truth is a necessary instrument for using logic—for using it, that is, for the discovery of further truth ... Briefly, you can only find truth with logic if you have already found truth without it.¹

This last remark of Chesterton’s is important. It is not the immediate purpose of *formal* logic to discover truth. That is the business of everyday observation and, in certain more formal circumstances, empirical science. Formal logic serves only to

1. G. K. Chesterton, “What is Rationalism?” in *The Man Who Was Orthodox: A Selection from the Uncollected Writings of G. K. Chesterton*, ed. A. L. Maycock (London: Dennis Dobson, 1963).

At its most basic level, logic can be divided into formal logic and material logic.



lead us from one truth to another. Truth is, however, an important consideration in the second major branch of logic: material logic. Truth is an important consideration (and is, in fact, the aim) of logic when considered in its totality—both formal and material.

In formal logic you study the form of an argument apart from or irrespective of its content, even though some content must be used in order to show the form. Maritain put it this way:

To study any complicated machine, a reaper for instance, we must begin by making it work in the void, while we learn how to use it correctly and without damaging it. In the same way we must first of all learn how to use reason correctly ... without damaging it.²

What is Formal Logic? Formal logic, the study of the form of arguments, is divided into *deduction* and *induction*. At the most fundamental level, the difference between the two is that in a valid deductive argument, the conclusion asserts no more than what is contained in the premises, while in an inductive argument, more is asserted in the conclusion than is contained in the premises. That is why, in a valid deductive argument, the truth of the premises *guarantees* the truth of the conclusion, while, in a valid inductive argument, the truth of the premises only makes the conclusion *probable*.

Valid deductive arguments offer *sufficient proof* for their conclusions, whereas valid inductive arguments only offer *good grounds* for believing in the conclusion. In fact, because induction is a weaker form of proof than deduction, many people do not even use the term 'valid' for a good inductive argument, because validity has the sense of necessary proof, which is absent from even a good inductive argument. They say instead that a good inductive argument is *cogent*, a term which has the sense of *convincing*, rather than *demonstrative*.

This distinction—between deductive and inductive inference—is often misunderstood in common language. Sir Arthur Conan Doyle, for example, has his character Sherlock Holmes refer to his own style of inference as "deduction," when, in fact, Sherlock Holmes is not notable for his *deduction*, but rather his *induction*. Holmes reasons from particular observations to more general conclusions.

In deduction, there are two kinds of reasoning: *categorical* and *hypothetical*. Categorical reasoning orders thought according to the connection between terms. For example, in the syllogism above, it is the arrangement of the terms 'man,' 'mortal,' and 'Socrates' that will determine the validity of the syllogism. Hypothetical reasoning orders thought according to the connection between whole statements. An example of hypothetical reasoning would be:

If all men are mortal, then Socrates is mortal

All men are mortal

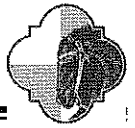
Therefore, Socrates is mortal

The proper connections between the statements "all men are mortal" and "Socrates is mortal" will determine whether the argument is valid or invalid.

Categorical reasoning encompasses three areas of study: *simple apprehension*, *judgment*, and *deductive inference*. Simple apprehension, says Maritain, "is the act by which the intellect grasps or perceives something without affirming or denying anything about it." Under simple apprehension, a student studies individual words, and

2. Jacques Maritain, *Formal Logic* (New York: Sheed & Ward, 1946).

Valid deductive arguments offer sufficient proof for their conclusions, whereas valid inductive arguments only offer good grounds for believing in the conclusion.



through an understanding of what words mean, he gets a solid grounding in what we mean when we say we know something. This is important in argumentation because if we use words in different senses in the same argument, we can end up coming to the wrong conclusions.

Judgment is the act by which we unite concepts by affirming or divide concepts by denying. In judgment, we study whole statements: we study the four ways in which statements can be opposite one another and the three ways in which statements can be transformed into other statements that mean the same thing. But it is in deductive inference that formal logic culminates.

Deductive inference is the act by which we acquire new knowledge by means of what we already know. Under deductive inference, the student learns the seven rules for validity and how to apply them. Once he has understood these, he is then shown the 64 different forms of arguments, with special attention to the 19 valid forms.

Advanced study in categorical reasoning includes an analysis of complex syllogisms, such as polysyllogisms, sorites, epicheirema, and dilemmas. In addition to categorical syllogisms (see p. 14), a study of formal deductive logic includes the study of hypothetical syllogisms (see p. 15).

In *hypothetical* syllogisms, the major premise is a compound proposition. There are three types of hypothetical syllogisms: *conditional* syllogisms (where the major premise is an "if ... then" statement), *disjunctive* syllogisms (where the major premise is an "either ... or" statement), and *conjunctive* syllogisms (where the major premise is a "both ... and" statement).

_____ **The Special Case of Modern Logic.** In addition to traditional logic, there are other systems widely considered to be examples of deductive formal logic. The two most widely used are *modern propositional logic* and *modern predicate logic*. Traditional logic, as we have said, concerns itself with the relationships between terms in an argument, using the verb 'to be' ('am,' 'is,' or 'are') as the connector. We have seen this in the previous example:

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

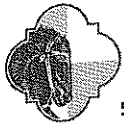
This argument deals with the relationships between and among the terms 'man,' 'mortal,' and 'Socrates.'

Modern propositional logic, however, deals with the relationship between propositions in an argument without taking the interior structure of the statements into account. It restricts itself to hypothetical reasoning and ignores categorical reasoning altogether.

According to traditional logicians Peter Kreeft and Ronald Tacelli, the reason for this has to do with the differing philosophical assumptions behind traditional and modern systems of logic:

This [traditional logic] is a logic of (linguistic) terms, which express (mental) concepts, which represent (real) essences, or the natures of things. (The Greek word *logos* has all three of these meanings.) Many modern philosophers are suspicious and skeptical of the venerable and commonsense notion of things having real essences or natures and of our ability to know them. Aristotelian logic assumes the existence of essences and

The two most widely used forms of modern logic are *propositional logic* and *predicate logic*.



our ability to know them, for its basic units are terms, which express concepts, which express essences. But modern symbolic logic does not assume what philosophers call metaphysical realism (that essences are real), but implicitly assumes instead metaphysical nominalism (that essences are only nomina, names, human labels), since its basic units are not terms but propositions. Then it relates these propositions in argumentative structures just as computers can do: if p, then q; p; therefore q.³

The mention of computers is very much to the point. In many respects, modern logic is an expression of the way computers think. In this respect, it is quite useful as preparation for computer programming. But many traditional logicians contend that while modern logic reflects the way that computers think, only traditional logic adequately reflects the thinking of human beings—beings who have a soul and who are able to apprehend the natures of things. Some traditional logicians even claim that modern logic is not logic at all, but rather that it is primarily a study of other mathematical, nonlogical, relations.

In any case, it should be pointed out that since modern logic is mathematical rather than linguistic, it has little use in the classical trivium, since the trivium (grammar, logic, and rhetoric) is language study. If it is to be considered a part of classical education, its place would better be considered to be in the quadrivium, since the quadrivium is the mathematical side of the liberal arts.

For example, take the following hypothetical syllogism as expressed in traditional logic:

If all men are mortal, then Socrates is a mortal
All men are mortal
Therefore, Socrates is a mortal

In propositional logic, this argument would be put in the form of symbols, as follows:

$P \rightarrow Q$
 P
 $\rightarrow Q$

This kind of an argument deals with the relationships between the statements “All men are mortal” and “Socrates is a mortal”—in other words, between whole statements.

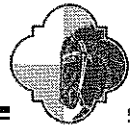
Modern predicate logic deals with the relationship between and among terms and propositions. It can use many kinds of connectors:

Some angels are evil. Furthermore, some animals are rational.
If there are any angels, then animals are sinful if they are rational.
Therefore, some animals are rational.

Modern logicians would also put this argument into symbolic form so that it could be analyzed using various rules. Both forms of modern logic contain some assumptions that conflict with those of traditional logic.

3. Peter Kreeft & Ronald Tacelli, *Handbook of Christian Apologetics* (Chicago: InterVarsity Press, (1994).

While deductive reasoning reasons from universal principles to particular conclusions, inductive reasoning reasons from particular premises to universal conclusions.



Material logic is concerned with the content, rather than the form, of reasoning: the *what*, rather than the *how*.

Inductive Reasoning. In addition to deduction, formal logic also encompasses *induction*. Generally speaking, try to think of reasoning as movements of the mind. While deductive reasoning (the kind of reasoning described above) moves from universal principles to particular conclusions, inductive reasoning moves from particular facts to universal conclusions.

There are three kinds of induction: *complete* induction, *incomplete* induction, and *reasoning by analogy*. In complete induction, all of the parts of the possible whole are enumerated in the premises; in incomplete induction, only some of the parts of the possible whole are enumerated; reasoning by analogy reasons from a particular fact or set of facts to another particular fact or set of facts.

What is Material Logic? Material logic, as we said, is concerned with the *content* of argumentation: the *what*, rather than the *how*, of reasoning. Although material logic is not quite as systematic as formal logic, there are three general divisions we can identify.

Division I: Under the first division, we study the *modes of being*—the different ways in which being can be expressed. The first division of being is according to its comprehension (this will be made clearer in a later chapter). This division is called the *ten categories* of being, which are the ten ways being may be said according to comprehension (in other words, according to the thing's intelligible content). These would include the following:

Substance: the names of people, animals, plants, and other natural things

Quantity: how much, how many, etc.

Quality: the names of dispositions, habits, abilities, inabilities, sensible qualities, figures, and forms

Relation: how a thing is related to other things

Action: how a things acts mentally or physically

Passion: how a thing is affected by other things

Time: when a thing is, was, or will be

Place: where a thing is, was, or will be

Posture: the order or disposition of the parts of a thing

Possession: the state of having something

In other words, something can be said to “be” in any one of these ten respects.

Additionally, under the first division of material logic, we would also study the *five predicables*. These are the five ways that being may be expressed according to extension (in other words, there are five ways you can say something about a thing with respect to what it refers to). They are as follows:

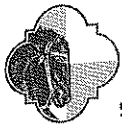
Genus: what general class a thing falls into

Species: what specific group under the general class a thing falls into

Difference: how a thing differs from other things in the same species

Property: the features or characteristics of a thing

Accident: what a thing happens to be



Division II: Under the second division, material logic encompasses the *modes of knowledge*, of which there are three: *definition*, *division*, and *argumentation*. Through the techniques of definition, we study what a thing is according to its *composition* or *intelligible content*. Through division, we learn what a thing is according to its *extension* (in other words, we learn what specific things a certain concept *applies to*). Under argumentation, we would study the value of an argument. This would include *necessary* arguments, *probable* arguments, and *fallacious* arguments.

Under definition, one of the things we would study would be the *four causes*:

Formal cause: what *kind* of thing it is

Material cause: what a thing is *composed of*

Efficient cause: who or what *made* a thing or *keeps it in existence*

Final cause: the *purpose* or *potential use* of a thing

Division III: Under the third division of material logic, we study *demonstration* and analyze argumentation into the different *modes of argument*. These would include *judicative*, *dialectical*, *rhetorical*, and *poetic* reasoning. Judicative reasoning is reasoning based on facts, self-evident principles, or true definitions. If the facts, principles or definitions on which it is based are true, the conclusion will necessarily be true. Dialectical reasoning is based on theories or opinions and yields only probable conclusions. Rhetorical reasoning is based on popular sayings, mottoes, proverbs, and examples. It is used to persuade people psychologically to accept a certain viewpoint. Finally, poetical reasoning is based on stories, songs, poems, or fables. Its chief appeal is to the imagination, and it seeks to attract the listener to the truth.

As traditional logician Edward Simmons has put it, "A knowledge of these relations, in addition to a knowledge of those which are of formal import, should equip a man to reason with total effectiveness."⁴

Summary. Logic is the branch of philosophy that studies reason as an instrument for attaining truth. It is divided into *formal* logic, which studies the form or structure of arguments, and *material* logic, which studies the content of arguments. Formal logic is divided into *deductive* reasoning, which reasons from general principles to particular conclusions, and *inductive* reasoning, which reasons from particular premises to general conclusions.

Material logic is divided into three main parts:

- I. Modes of being
 - a. the *ten categories*—ten ways in which being can be expressed
 - b. the *five predicables*—five ways something can be said about something else
- II. Modes of knowledge
 - a. *definition*
 - b. *division*
 - c. *argumentation*
- III. Modes of argumentation, or demonstration
 - a. *judicative*
 - b. *dialectical*
 - c. *rhetorical*
 - d. *poetic*

4. Peter Kreeft & Ronald Tacelli, *A Handbook of Christian Apologetics* (Chicago: Intervarsity Press, (1994).

Under the third division of material logic, we study demonstration and analyze argumentation into the different modes of argument.



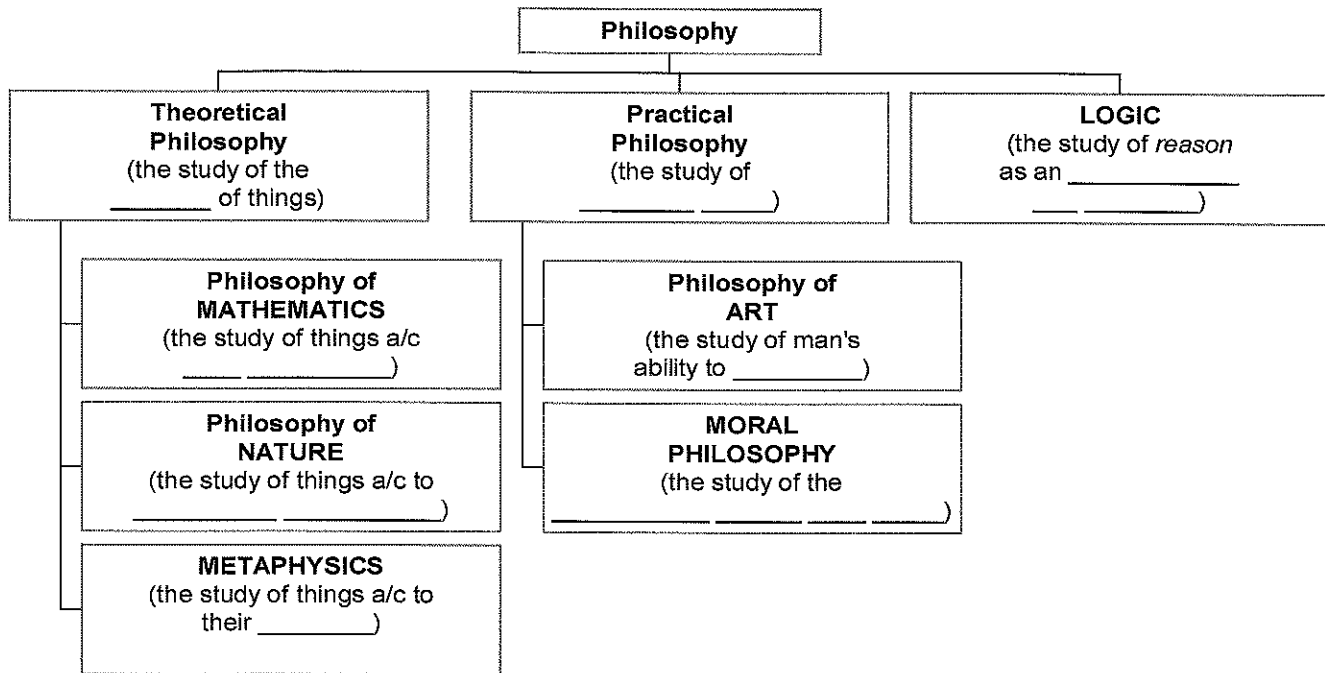
Exercises for Day 1. Read the entire chapter. Try only to get a general idea of what the chapter is about. Then read the introduction. Read this section carefully with the help of the questions below, and try to understand it the best you can.

1. What definition of logic is given in the introduction? _____

2. What are the three divisions of philosophy?

1. _____
2. _____
3. _____

3. Fill out the following chart:



Read "The Two Kinds of Logic." Read this section carefully with the help of the questions below, and try to understand it the best you can.

4. Into what two categories is traditional logic divided?

1. _____
2. _____

5. What does *formal* logic study? _____

6. What does *material* logic study? _____

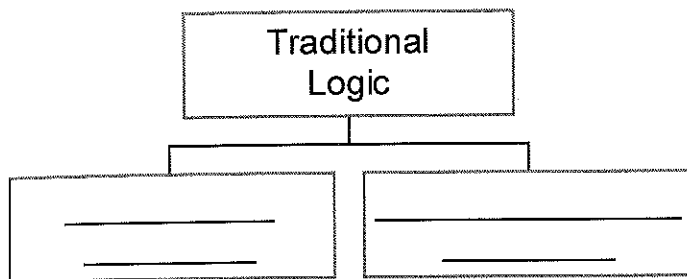


7. From the perspective of formal logic, what would we want to know about an argument? _____

8. From the perspective of material logic, what would we want to know about an argument? _____

9. Draw a chart representing the division of traditional logic according to your answer in Question 4 above:

The Basic Division of Traditional Logic



10. Using the diagram in Question 9, and the text from which you drew to complete it, write a simple outline of the division you showed graphically in Question 9:

Example: The major subject or point would go here
 The first secondary subject or subpoint would go here
 The second secondary subject or subpoint would go here

11. When we want to know whether an argument is valid, what specifically do we want to know? _____

12. When we want to know whether an argument is sound, what specifically do we want to know? _____

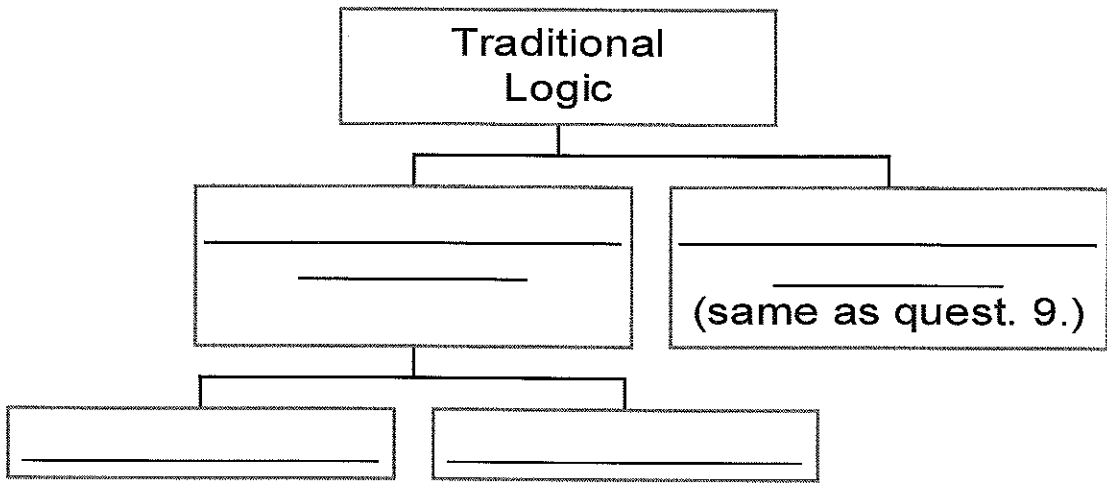
Exercises for Day 2. Read "What is Formal Logic?" Read this section carefully with the help of the questions below, and try to understand it the best you can.

13. What are the two kinds of inference studied under formal logic?

1. _____
2. _____



14. Fill out the following chart showing the division of formal logic (the answers for the top two rows of boxes will be the same as in Question 9):



15. Using the diagram you completed above, and the text from which you drew to complete it, write a simple outline of this section of the text we outlined graphically in Question 14, just as you did for Questions 9 and 10 above:

Traditional Logic

16. What is the difference between deductive and inductive reasoning?

In deductive reasoning, the _____ asserts no more than what is contained in the _____.

In inductive reasoning, more is asserted in the _____ than is contained in the _____.

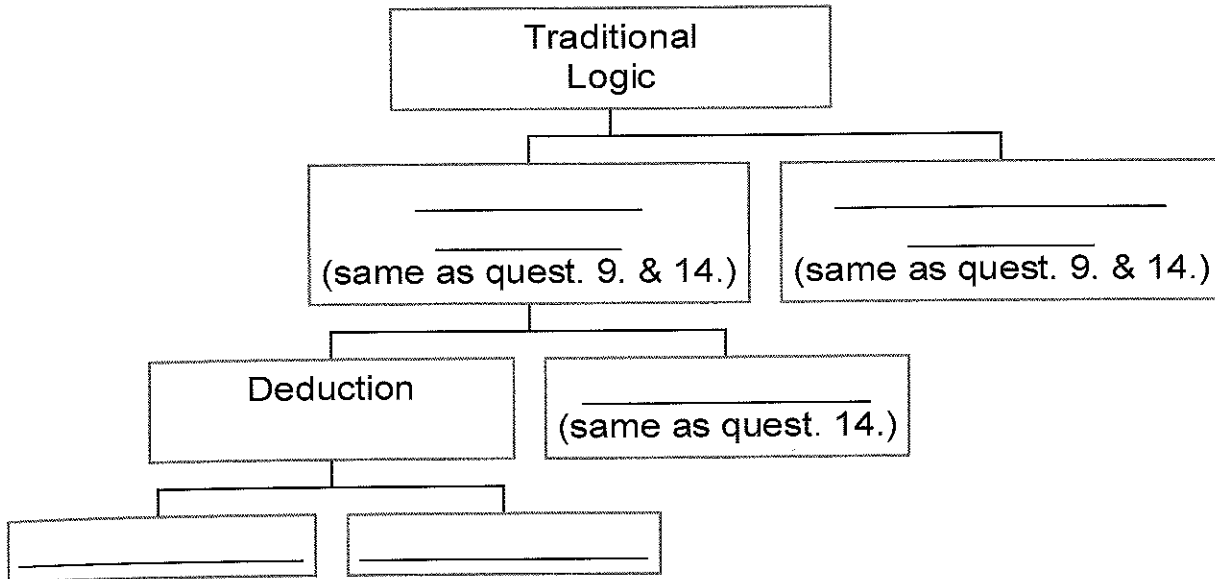
Valid deductive arguments offer _____ proof for their _____, whereas valid inductive arguments offer only _____ for believing the _____.

We say that good deductive arguments are _____, but that good inductive arguments are _____.

17. Into what two kinds of reasoning can deduction be divided?

1. _____
2. _____

18. Fill out the following chart showing the division of deduction:



19. Write a simple outline of this section of the text we outlined graphically in Question 18:

20. How does categorical reasoning order thought? _____

21. How does hypothetical reasoning order thought? _____

22. What three areas of study does categorical reason encompass?

1. _____
2. _____
3. _____

23. What is simple apprehension? _____

24. What is judgment? _____



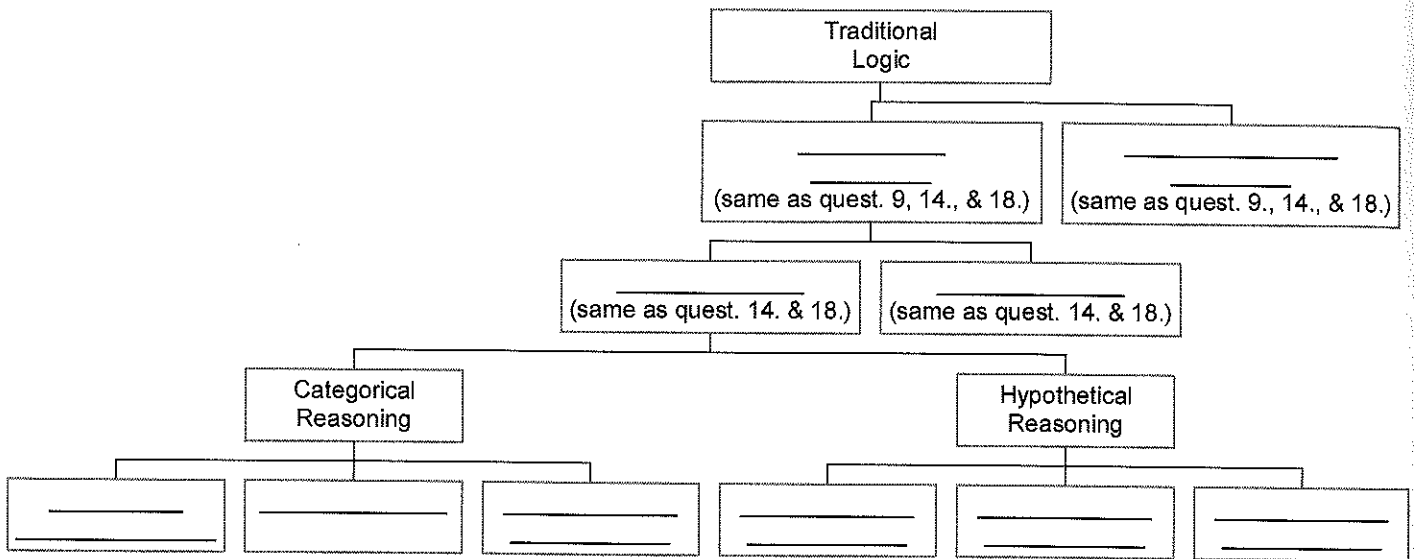
Daily Exercises for Chapter 1

25. What is deductive inference? _____

26. What are the three kinds of hypothetical syllogisms?

1. _____
2. _____
3. _____

27. Fill out the following chart showing the division of categorical and hypothetical reasoning:



28. Using the diagram you completed above, and the text from which you drew to complete it, write a simple outline of this section of the text we outlined graphically in Question 27:



Exercises for Day 3. Read "The Special Case of Modern Logic." Read this section carefully with the help of the questions below, and try to understand it the best you can.

29. What are the two most widely used systems of modern logic?

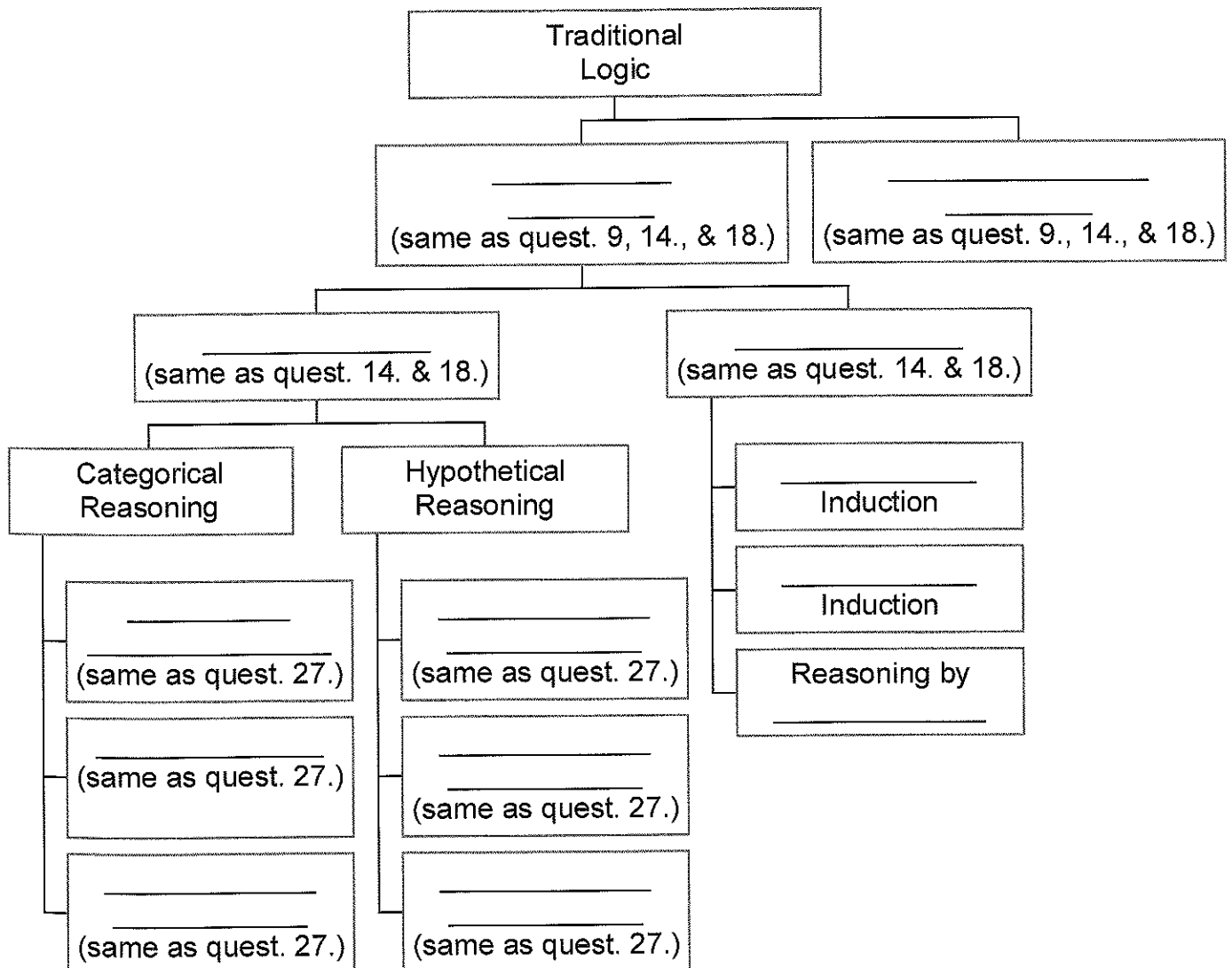
1. _____
2. _____

Read "Inductive Reasoning." Read this section carefully with the help of the questions below, and try to understand it the best you can.

30. What are the three kinds of induction?

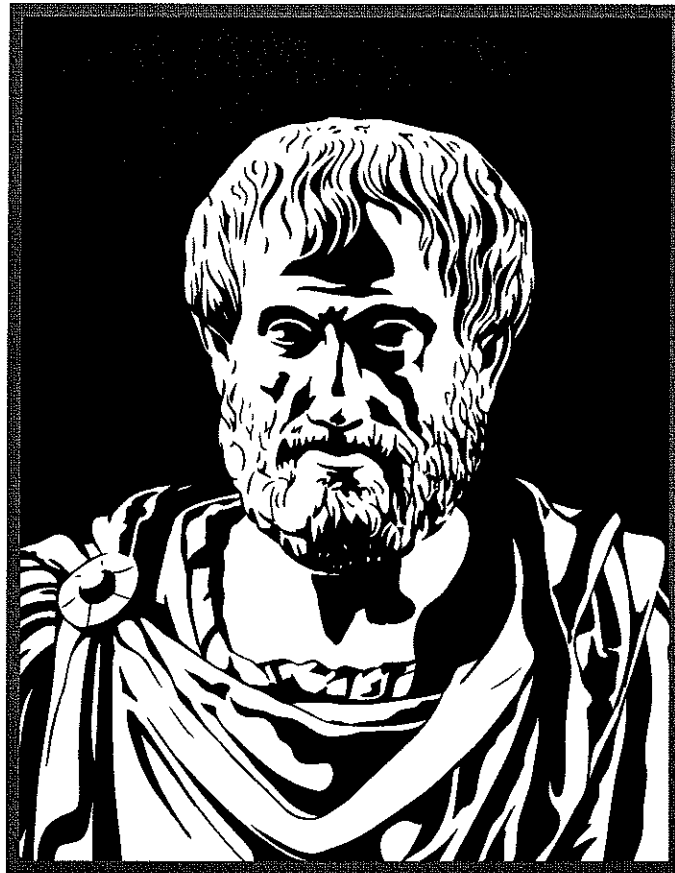
1. _____
2. _____
3. _____

31. Fill out the following chart showing the major subject of this part of the reading and the two parts of this subject that the reading discusses (Hint: the words that go in the bottom two boxes are italicized in the text):



Aristotle's
**MATERIAL
LOGIC**

A Course in How to Think



Martin Cothran

Answer Key

CLASSICAL TRIVIUM CORE SERIES



MEMORIA PRESS

www.MemoriaPress.com

MATERIAL LOGIC

ANSWER KEY
Martin Cothran

ISBN 978-1-930953-58-1

Second Edition © 2006 Memoria Press

All rights reserved. No part of this book may be reproduced in any form
by any means without written permission from the publisher.

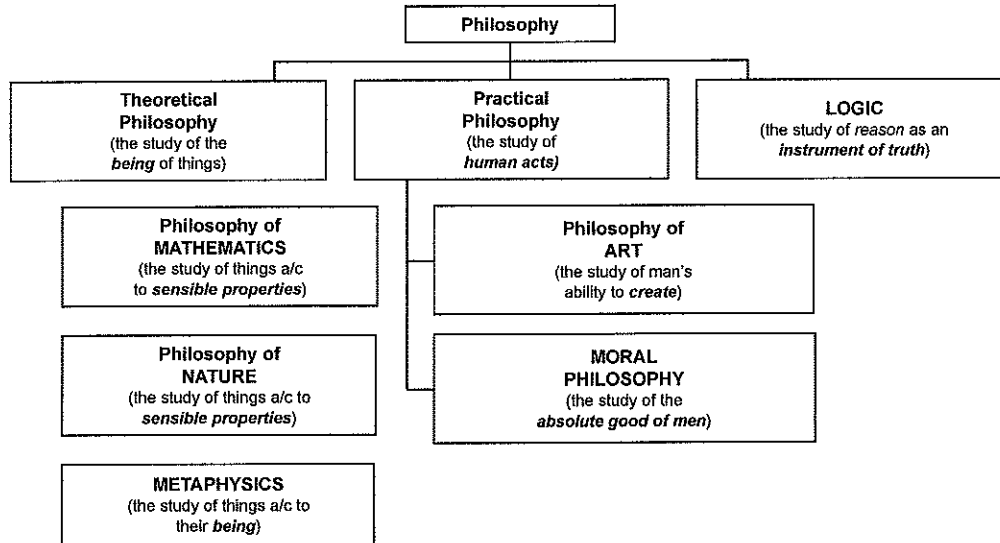
Table of Contents

CHAPTER 1	3
CHAPTER 2	11
CHAPTER 3	12
CHAPTER 4	14
CHAPTER 5	16
CHAPTER 6	23
CHAPTER 7	27
CHAPTER 8	30
CHAPTER 9	33
CHAPTER 10	36
CHAPTER 11	39
CHAPTER 12	40
CHAPTER 13	41
CHAPTER 14	42
CHAPTER 15	44

Answer Key: Chapter 1

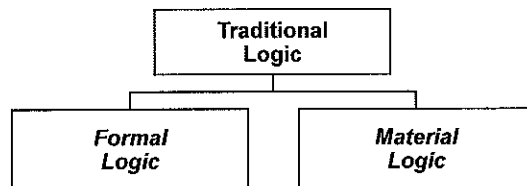
Exercises for Day 1

1. What definition of logic is given in the introduction? Logic is the art of reason. As Jacques Maritain said, logic "studies reason itself as an instrument of knowledge, or as a means of acquiring and possessing the true."
2. What are the three divisions of philosophy?
 1. Theoretical Philosophy
 2. Practical Philosophy
 3. Logic
3. Fill out the following chart:



4. Into what two categories is logic divided?
 1. Formal logic
 2. Material logic
5. What does formal logic study? Formal logic studies the form or structure of arguments.
6. What does material logic study? Material logic studies the content of argumentation.
7. From the perspective of formal logic, what would we want to know about an argument? From the perspective of formal logic, we would want to know whether the argument is valid.
8. From the perspective of material logic, what would we want to know about an argument? From the perspective of material logic, we would want to know whether the argument is sound.
9. Draw a chart representing the division of traditional logic according to your answer in Question 4 above:

The Basic Division of Traditional Logic



10. Using the diagram in Question 9, and the text from which you drew to complete it, write a simple outline of the division you showed graphically in Question 9:
 - Traditional Logic
 - Formal Logic
 - Material Logic
11. When we want to know whether an argument is valid, what specifically do we want to know? We want to know whether the conclusion logically follows from the premises.

Answer Key: Chapter 1

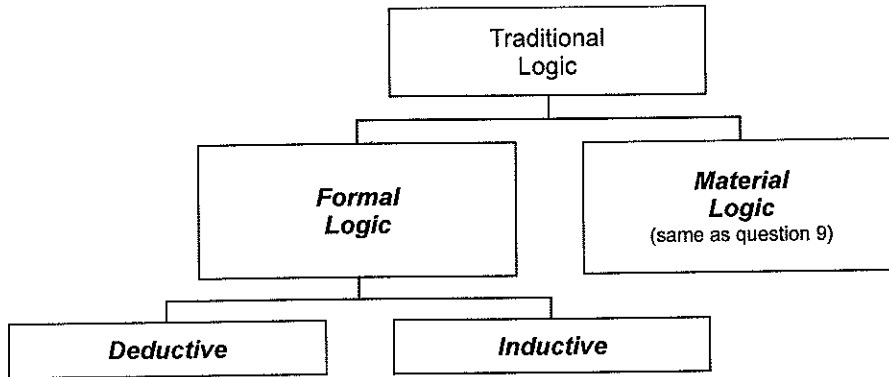
12. When we want to know whether an argument is sound, what specifically do we want to know? We would want to know, in other words, whether the two premises are, in fact, true; what the terms 'men', 'mortal' and 'Socrates' refer to and how; and many other things not directly related to the form of the argument.

Exercises for Day 2

13. What are the two kinds of inference studied under formal logic?

1. Deduction
2. Induction

14. Fill out the following chart showing the division of formal logic (the answers for the top two rows of boxes will be the same as in Question 9):



15. Using the diagram you completed above, and the text from which you drew to complete it, write a simple outline of this section of the text we outlined graphically in Question 14, just as you did for Questions 9 and 10 above:

Traditional Logic

Formal Logic

Deductive Logic

Inductive Logic

Material Logic

16. What is the difference between deductive and inductive reasoning?

In deductive reasoning, the conclusion asserts no more than what is contained in the premises.

In inductive reasoning, more is asserted in the conclusion than is contained in the premises.

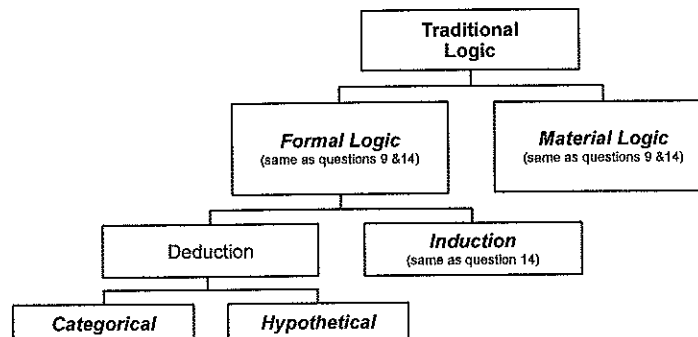
Valid deductive arguments offer sufficient proof for their conclusions, whereas valid inductive arguments offer only good grounds for believing the conclusion.

We say that good deductive arguments are valid, but that good inductive arguments are cogent.

17. Into what two kinds of reasoning can deduction be divided?

1. Categorical
2. Hypothetical

18. Fill out the following chart showing the division of deduction:

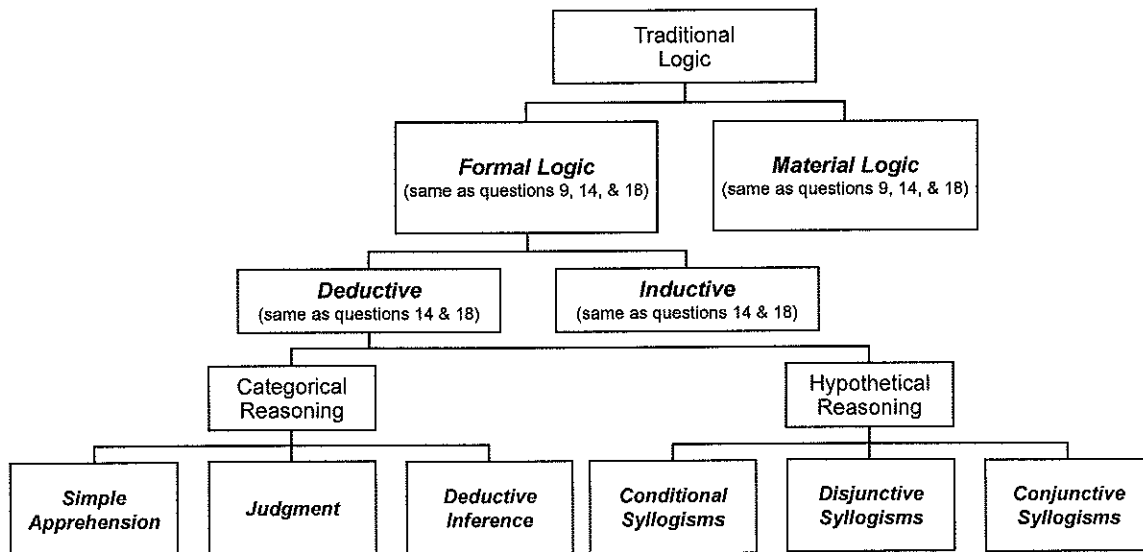


19. Write a simple outline of this section of the text we outlined graphically in Question 18:

Traditional Logic
 Formal Logic
 Deduction
 Categorical Reasoning
 Inductive Reasoning
 Induction

Material Logic

20. How does categorical reasoning order thought? Categorical reasoning orders thought according to the connection between terms.
 21. How does hypothetical reasoning order thought? Hypothetical reasoning orders thought according to the connection between whole statements.
 22. What three areas of study does categorical reasoning encompass?
 1. Simple Apprehension
 2. Judgment
 3. Deductive Inference
 23. What is simple apprehension? Simple apprehension is the act by which the intellect grasps or perceives something without affirming or denying anything about it.
 24. What is judgment? Judgment is the act by which we unite concepts by affirming or divide concepts by denying.
 25. What is deductive inference? Deductive inference is the act by which we acquire new knowledge by means of what we already know.
 26. What are the three kinds of hypothetical syllogisms?
 1. Conditional
 2. Disjunctive
 3. Conjunctive
 27. Fill out the following chart showing the division of categorical and hypothetical reasoning:



28. Using the diagram you completed above, and the text from which you drew to complete it, write a simple outline of this section of the text we outlined graphically in Question 27:

Traditional Logic
 Formal Logic
 Deduction
 Categorical Reasoning
 Simple Apprehension
 Judgment
 Deductive Inference
 Hypothetical Reasoning
 Conditional Syllogisms
 Disjunctive Syllogisms
 Conjunctive Syllogisms
 Induction

Material Logic