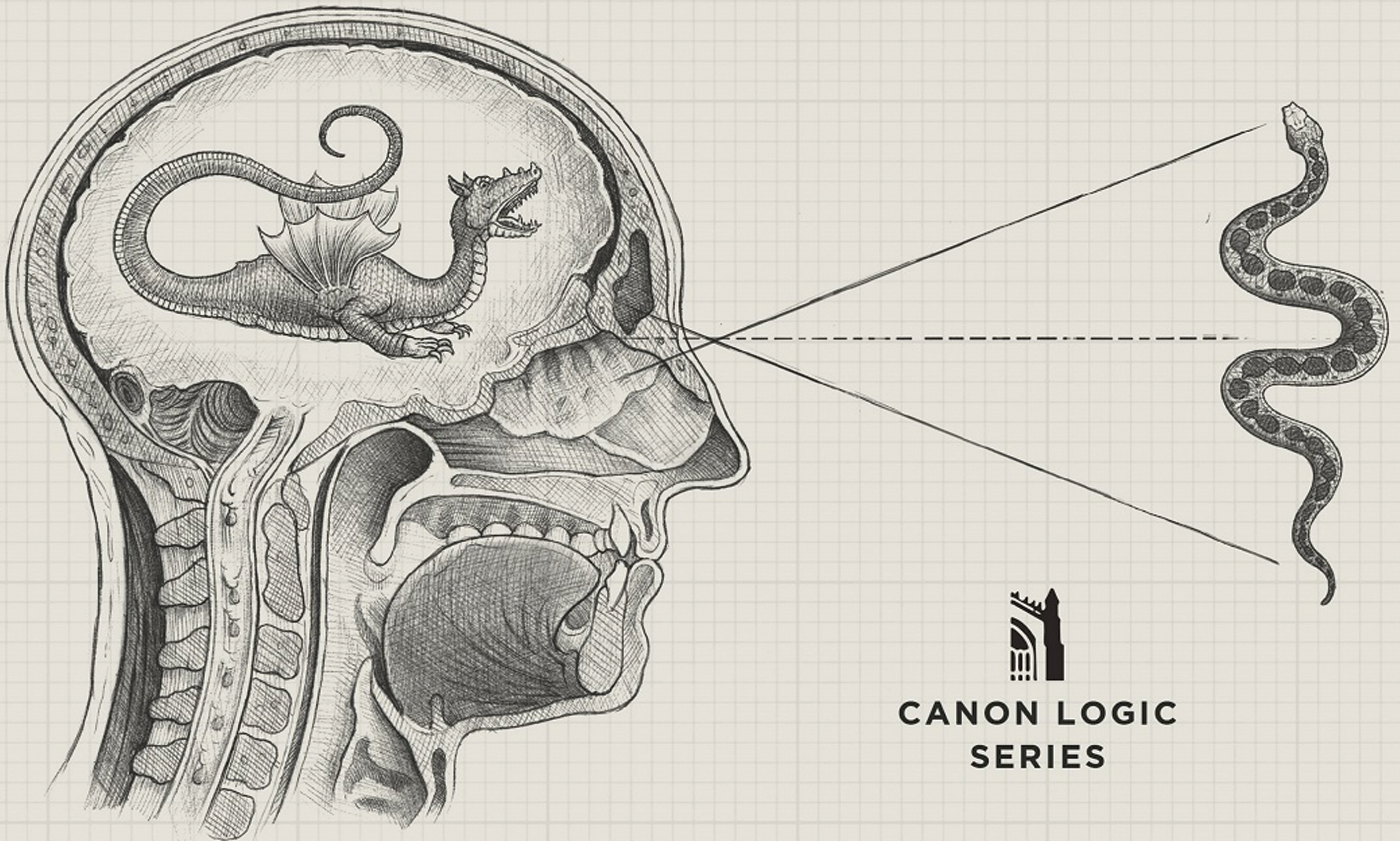


teacher edition

INTRODUCTORY LOGIC

The Fundamentals of Thinking Well



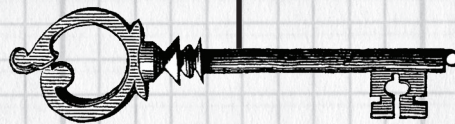
CANON LOGIC
SERIES

INTRODUCTORY LOGIC

The Fundamentals of Thinking Well

TEACHER: FIFTH EDITION

Canon Logic Series



A NOTE to the TEACHER for the FIFTH EDITION

Logic is the science and art of reasoning well. We reason as we draw conclusions from other information by means of logical arguments. Arguments are made up of premises and conclusions, which are types of statements. Statements are sentences that are true or false. Categorical statements predicate something of a subject, and thus connect subject and predicate terms. A term is the verbal expression of a concept. Consequently, in order to follow logical arguments as we reason, we must know how to determine the truth of statements, and to understand statements, we need to be able to define the terms that make up those statements.

In this text we begin with terms. Your students will learn how to define terms and how to relate terms to other terms in genus and species charts. They will then study statements, discovering ways to determine the truth of a given statement, and will examine how statements relate to each other. Next, they will learn how to put statements together into arguments, and gather strategies for distinguishing valid arguments from invalid ones. They will do this first in the tightly controlled, artificial environment of categorical syllogisms. You will then lead them into the real world as they take the tools they have mastered and learn how to apply them to arguments in normal English. Once they have gained the skills of analyzing the arguments of others, they will take a brief foray into constructing arguments to establish conclusions of their own. They will then finish this course by learning to detect the fallacies that litter arguments in daily life.

This logic course thus follows the program outlined by Dorothy Sayers in “The Lost Tools of Learning.” In that seminal essay, she outlined for us the course of study for the medieval logic student, who learned “how to use language: how to define his terms and make accurate statements; how to construct an argument and how to detect fallacies in argument.” Terms, statements, arguments, fallacies—these are concepts that will become familiar to your students in this study of *Introductory Logic: The Fundamentals of Thinking Well*.

April 2014

PUBLISHER'S NOTE from CANON PRESS

SCHEDULES

It's up to you to choose the pace for working through *Introductory Logic*. If you're comfortable with moving at a quick pace, and can schedule three to five classes per week, you can work through the course in one semester. Those who prefer a more leisurely pace can plan to complete the course in a year with one to three class meetings per week. On the following two pages, we have provided two sample schedules. The first option is based on meeting daily for one semester. The second option fits a schedule of three weekly classes for a whole year. Use these as a guideline, and adapt as needed to meet the needs of your class or homeschool. Just cover the material listed for each week in as many days as you have per week, and you'll finish on time. Or alter either schedule to suit your students' pace and the time you have allotted for the course: add or subtract weeks and adjust the pacing of the material accordingly to fit your needs.

PAGE NUMBERS

This Teacher text contains the entire Student version as well, with the same page numbers. The Arabic numerals (on single-columned pages) are the same in both texts. Your teacher notes (double-columned pages) are numbered with Roman numerals.

DAILY LESSON PLANS

Each student lesson in the Teacher edition is accompanied by double-columned teaching notes: objectives, step-by-step teaching instructions,

assignments, and more. You can decide whether you want to read through the lesson with the students out loud, have the students read through it alone and then teach through it, teach through it without reading it...whatever suits your personal teaching style best.

GRADING

This Teacher Edition contains all the answers you need for all exercises, quizzes, and tests. For many lessons, answers may vary depending on the imagination and creativity of your students. Expect this; you'll still be able to grade the differing answers fairly if you, as teacher, thoroughly understand the principles involved. We've included point values for each quiz or exercise question to help with this. Consider giving partial credit for incorrect answers that have a piece of the final answer right. If you mark an answer wrong, but a student thinks it is *not* wrong, consider allowing them to try to argue the point back, in writing. This gives them practice arguing, and they just might be right.

DVD COURSE

If you can take advantage of the fantastic DVD course companion, we'd suggest that you watch the day's lesson first (let our teacher's years of classroom experience do the hard work), and then you can answer any questions as your students work on the exercises. The DVD works through every "Form B" Test, so that can be especially helpful for practice tests.

**As always, if you've got questions, ideas, or just want to get in touch,
call 208-892-8074 or find us online at www.canonpress.com.
We'd love to help you as you teach the fundamentals of thinking well.**

INTRODUCTORY LOGIC

SCHEDULE OPTION 1: ONE SEMESTER

This schedule will allow you to cover the contents of *Introductory Logic* meeting daily over the course of a sixteen-week semester. Adjust daily or weekly assignments as needed.

Week	Day	Text	Assignment	Week	Day	Text	Assignment
1	Mon	Introduction		9	Mon	Lesson 24	Exercise 22
	Tues	Lesson 1	Exercise 1		Tues	Challenge Project	Exercise 22
	Wed	Lesson 2	Exercise 2		Wed	Challenge Project	Exercise 22
	Thur	Lesson 3	Exercise 3		Thur	Quiz Day	<i>Quiz Nine</i>
	Fri	Quiz Day	<i>Quiz One</i>		Fri	Lesson 25	Exercise 23
2	Mon	Lesson 4	Exercise 4	10	Mon	Lesson 26	Exercise 24
	Tues	Lesson 5	Exercise 5		Tues	Lesson 26	Exercise 25
	Wed	Quiz Day	<i>Quiz Two</i>		Wed	Quiz Day	<i>Quiz Ten</i>
	Thur	Review for Test	Review Questions		Thur	Review for Test	Review Questions
	Fri	Test Day	<i>Test One</i>		Fri	Test Day	<i>Test Five</i>
3	Mon	Lesson 6	Exercise 6	11	Mon	Lesson 27	Exercise 26
	Tues	Lesson 7	Exercise 7		Tues	Lesson 27	Exercise 27:1-3
	Wed	Lesson 8	Exercise 8		Wed	Lesson 27	Exercise 27:4-6
	Thur	Quiz Day	<i>Quiz Three</i>		Thur	Quiz Day	<i>Quiz Eleven</i>
	Fri	Lesson 9	Exercise 9		Fri	Lesson 28	Exercise 28
4	Mon	Lesson 10	Exercise 10	12	Mon	Lesson 29	Exercise 29
	Tues	Lesson 11	Exercise 11		Tues	Lesson 29	Exercise 30
	Wed	Quiz Day	<i>Quiz Four</i>		Wed	Quiz Day	<i>Quiz Twelve</i>
	Thur	Review for Test	Review Questions		Thur	Review for Test	Review Questions
	Fri	Test Day	<i>Test Two</i>		Fri	Test Day	<i>Test Six</i>
5	Mon	Lesson 12	Exercise 12	13	Mon	Lesson 30	Exercise 31
	Tues	Lesson 13	Exercise 13		Tues	Lesson 30	Exercise 32
	Wed	Lesson 14	Exercise 14		Wed	Quiz Day	<i>Quiz Thirteen</i>
	Thur	Quiz Day	<i>Quiz Five</i>		Thur	Lesson 31	Exercise 33
	Fri	Lessons 15 & 16	Exercise 15		Fri	Lesson 31	Exercise 34
6	Mon	Lesson 17	Exercise 16	14	Mon	Lesson 32	Exercise 35:1-5
	Tues	Lesson 18	Exercise 17		Tues	Lesson 32	Exercise 35:6-10
	Wed	Quiz Day	<i>Quiz Six</i>		Wed	Quiz Day	<i>Quiz Fourteen</i>
	Thur	Review for Test	Review Questions		Thur	Review for Test	Review Questions
	Fri	Test Day	<i>Test Three</i>		Fri	Test Day	<i>Test Seven</i>
7	Mon	Lesson 19	Exercise 18	15	Mon	Lesson 33	Exercise 36
	Tues	Lesson 20	Exercise 19:1-5		Tues	Lesson 34	Exercise 37
	Wed	Lesson 20	Exercise 19:6-10		Wed	Lesson 35	Exercise 38
	Thur	Quiz Day	<i>Quiz Seven</i>		Thur	Quiz Day	<i>Quiz Fifteen</i>
	Fri	Lesson 21			Fri	Lesson 36	Exercise 39
8	Mon	Lesson 22	Exercise 20	16	Mon	Review for Test	Review Questions
	Tues	Lesson 23	Exercise 21		Tues	Test Day	<i>Test Eight</i>
	Wed	Quiz Day	<i>Quiz Eight</i>		Wed	Review for Comprehensive Exam	
	Thur	Review for Test	Review Questions		Thur	Review for Comprehensive Exam	
	Fri	Test Day	<i>Test Four</i>		Fri	Exam	<i>Comprehensive Exam</i>

SCHEDULE OPTION 2: FULL YEAR

This schedule will allow you to cover the contents of *Introductory Logic* meeting three days per week over the course of a thirty-two-week school year. Adjust as needed if you meet fewer days per week.

Week	Day	Text	Assignment	Week	Day	Text	Assignment
1	1	Introduction		17	49	Lesson 24	Exercise 22
	2	Lesson 1	Exercise 1		50	Challenge Project	Exercise 22
	3	Lesson 2	Exercise 2		51	Challenge Project	Exercise 22
2	4	Lesson 3	Exercise 3	18	52	Finish Project and Review	
	5	Finish Exercises and Review			53	Quiz Day	<i>Quiz Nine</i>
	6	Quiz Day	<i>Quiz One</i>		54	Lesson 25	Exercise 23
3	7	Lesson 4	Exercise 4	19	55	Lesson 26	Exercise 24
	8	Lesson 5	Exercise 5		56	Lesson 26	Exercise 25
	9	Quiz Day	<i>Quiz Two</i>		57	Quiz Day	<i>Quiz Ten</i>
4	10	Review for Test	Review Questions	20	58	Review for Test	Review Questions
	11	Practice Test	<i>Test 1a</i>		59	Practice Test	<i>Test 5a</i>
	12	Test	<i>Test 1b</i>		60	Test Day	<i>Test 5b</i>
5	13	Lesson 6	Exercise 6	21	61	Lesson 27	Exercise 26
	14	Lesson 7	Exercise 7		62	Lesson 27	Exercise 27:1-3
	15	Lesson 8	Exercise 8		63	Lesson 27	Exercise 27:4-6
6	16	Finish Exercises and Review		22	64	Finish Exercises and Review	
	17	Quiz Day	<i>Quiz Three</i>		65	Quiz Day	<i>Quiz Eleven</i>
	18	Lesson 9	Exercise 9		66	Lesson 28	Exercise 28
7	19	Lesson 10	Exercise 10	23	67	Lesson 29	Exercise 29
	20	Lesson 11	Exercise 11		68	Lesson 29	Exercise 30
	21	Quiz Day	<i>Quiz Four</i>		69	Quiz Day	<i>Quiz Twelve</i>
8	22	Review for Test	Review Questions	24	70	Review for Test	Review Questions
	23	Practice Test	<i>Test 2a</i>		71	Practice Test	<i>Test 6a</i>
	24	Test Day	<i>Test 2b</i>		72	Test Day	<i>Test 6b</i>
9	25	Lesson 12	Exercise 12	25	73	Lesson 30	Exercise 31
	26	Lesson 13	Exercise 13		74	Lesson 30	Exercise 32
	27	Lesson 14	Exercise 14		75	Quiz Day	<i>Quiz Thirteen</i>
10	28	Finish Exercises and Review		26	76	Lesson 31	Exercise 33
	29	Quiz Day	<i>Quiz Five</i>		77	Lesson 31	Exercise 34
	30	Lesson 15, 16	Exercise 15		78	Finish exercises	
11	31	Lesson 17	Exercise 16	27	79	Lesson 32	Exercise 35:1-5
	32	Lesson 18	Exercise 17		80	Lesson 32	Exercise 35:6-10
	33	Quiz Day	<i>Quiz Six</i>		81	Quiz Day	<i>Quiz Fourteen</i>
12	34	Review for Test	Review Questions	28	82	Review for Test	Review Questions
	35	Practice Test	<i>Test 3a</i>		83	Practice Test	<i>Test 7a</i>
	36	Test Day	<i>Test 3b</i>		84	Test Day	<i>Test 7b</i>
13	37	Lesson 19	Exercise 18	29	85	Lesson 33	Exercise 36
	38	Lesson 20	Exercise 19:1-5		86	Lesson 34	Exercise 37
	39	Lesson 20	Exercise 19:6-10		87	Lesson 35	Exercise 38
14	40	Finish Exercises and Review		30	88	Lesson 35	Exercise 38
	41	Quiz Day	<i>Quiz Seven</i>		89	Quiz Day	<i>Quiz Fifteen</i>
	42	Lesson 21			90	Lesson 36	Exercise 39
15	43	Lesson 22	Exercise 20	31	91	Review for Test	Review Questions
	44	Lesson 23	Exercise 21		92	Practice Test	<i>Test 8a</i>
	45	Quiz Day	<i>Quiz Eight</i>		93	Test Day	<i>Test 8b</i>
16	46	Review for Test	Review Questions	32	94	Review for Comprehensive Exam	
	47	Practice Test	<i>Test 4a</i>		95	Review for Comprehensive Exam	
	48	Test Day	<i>Test 4b</i>		96	Exam	<i>Comprehensive Exam</i>

LOGIC: ITS NATURE AND PURPOSE

Introductory Logic, pp. 1–6

STUDENT OBJECTIVES

1. Define *logic*.
2. Define *reasoning*.
3. Identify the three laws of thought.
4. Construct the logic chart, explain it, and answer questions about it.

TEACHING INSTRUCTIONS

1. Read the Introduction, “Logic: Its Nature and Purpose” (*Introductory Logic* pp. 1–6) aloud to the students (or have them take turns reading it). You can either read it in its entirety and then continue into the following steps, or stop and discuss the following as you go.
2. Ask students how they would define *reasoning*. After fielding weird answers and blank stares, explain that **reasoning means drawing proper conclusions from information we already have**. Give an example or two (“You smell smoke and decide something is burning. That’s reasoning. Your friend is unnaturally quiet and you decide she’s upset. That’s reasoning.”) Make sure students understand that reasoning is one of God’s gifts to us so that we can get at truth; it is *not* what constitutes our being made in the image of God.
3. Write the definition of formal logic on the board: **Formal logic is the science and art of reasoning well**. Ask the students why they

think that logic is a *science*. (Because it is about discovering the *rules* by which we reason.) Ask why they think logic is also an *art*. (Because the rules can be applied skillfully to discourse, we can't follow the rules woodenly; we have to practice logic skillfully. Have them think about what that might mean.) Make sure that students understand that logic was not created by man or God, but is an *attribute* of God that we see all over his creation.

4. Ask the students, “What is the first thing you need to build when you're building a house?” (A foundation. Something to build on.) Explain that reasoning is a lot like house-building: you always need something to build it on. Tell them that in logic we build on three rules, or laws. Remind students that impersonal laws don't have authority in themselves: somebody in authority has to give them. Emphasize that the three Laws of Thought are grounded in the Lawgiver, in the triune God.
5. Introduce the first law using the phrase “Jesus is Lord.” Point out that there are only two responses to this statement, faith or unbelief, so the statement must be either true or false; you can't say, in a dreamy voice, “That statement is beyond truth and falsity.” Write on the board the **Law of Excluded Middle: any statement is either true or false**. Insist that there is nothing in between. (Students may try to play devil's advocate and bring up “maybe” sentences or nonsense sentences. Be ready to explain that

a “maybe” sentence is still true or false, and a nonsense sentence is just that—nonsense.)

6. Introduce the second law with the same phrase “Jesus is Lord”: if Jesus is Lord then Jesus is Lord. Explain that this might be kind of obvious, but a lot of people try to say things like “Well, ‘Jesus is Lord’ is true for you, but not for me.” If something is true, it’s true everywhere, for everyone. Write on the board the **Law of Identity: If a statement is true, then it is true.**
7. Explain, thirdly, that you can’t agree that “Jesus is Lord” and disagree with it at the same time without having a split personality. Write on the board the **Law of Non-Contradiction: A statement cannot be both true and false.**
8. Explain that these laws might seem obvious, but that if we didn’t assume them, we wouldn’t be able to say anything for sure. But also point out that even though the world follows these laws, the world is nevertheless full of mystery, because God is full of mystery. He is Three in One. Ask the students for other examples of things we can’t understand through logic alone. Emphasize that **logic must always give way to mystery.**
9. Draw the chart on page 6 of *Introductory Logic* on the board as you explain it. (Reassure anyone worried that while they need to be able

to reproduce this chart, they do not need to understand all the concepts yet.) Explain that **formal logic deals directly with proper and improper modes of reasoning**, while **informal logic deals with operations of thinking that are indirectly related to reasoning**, such as defining terms, relating terms, and determining relationships between statements. Explain that formal logic also divides into two main branches: **Induction is reasoning to probable conclusions from examples or experience** (e.g., “Every cat I’ve ever had has purred when I petted it. Probably all cats purr when petted.”), while **deduction is reasoning with certainty from premises to conclusions** (“All dogs bark. This is a dog. Therefore it barks.”). Inductive arguments are either **strong** or **weak**; deductive arguments are either **valid** or **invalid**. The two branches of deductive reasoning are categorical and propositional logic. Tell students that in this book you will be studying both informal and categorical logic.

ASSIGNMENT

1. Have students review the three laws and practice drawing the logic chart.

LOGIC: ITS NATURE AND PURPOSE

God created man with the ability to reason: “Come now, and let us reason together, saith the Lord” (Is. 1:18). He did this so that we could communicate with Him and with one another. This enables us to love and obey Him. Reasoning means drawing proper conclusions from other information. A proper use of reason allows us to form rational statements, and to understand the statements that are made by others. It allows us, for example, to take universal statements such as “God has commanded all men everywhere to repent” and to apply them, first to ourselves and then to our neighbor: “We are men, therefore we must repent.” Without the ability to reason, we would be unable to discuss, preach, read, hear the gospel, or follow God’s commands. In other words, proper reasoning opens the mind so that it can close upon truth.

Some have assumed that this ability to reason is what constitutes man being created in the image of God. But there are several problems with this assumption. First, there are other creatures (like angels and cherubim) who have an ability to reason, but who do not bear the image of God the same way that man does. Another problem is that it implies that humans who are very young (e.g., a fertilized human ovum) or who are severely retarded cannot bear God’s image, or that they do so imperfectly. Rather than treating reason as the image of God in man, it would be far better to treat reason as a gift that God gives (out of His own nature and character) to all intelligent creatures. The more He gives, the greater our responsibility to love Him, as Scripture says, “with all our minds.”

Formal logic is the science and art of reasoning well. As a science, logic includes discovering and identifying the patterns or rules by which we reason. As an art, logic teaches how to follow those rules, without abusing them in a wooden (and unreasonable) way. About sixteen centuries ago, Augustine said this about the science of logic:



KEY POINT

Reason opens our minds so that they can close upon truth. Reason is a gift from God; it is *not* the single, essential aspect of bearing God’s image.



DEFINITION

Logic is the science and art of reasoning well.

And yet the validity of logical sequences is not a thing devised by men, but is observed and noted by them that they may be able to learn and teach it; for it exists eternally in the reason of things, and has its origin with God. For as the man who narrates the order of events does not himself create that order; and as he who describes the situations of places, or the natures of animals, or roots, or minerals, does not describe arrangements of man; and as he who points out the stars and their movements does not point out anything that he himself or any other man has ordained; in the same way, he who says, “When the consequent is false, the antecedent must also be false,” says what is most true; but he does not himself make it so, he only points out that it is so. (*On Christian Doctrine*, book II, chapter 32)



KEY POINT

Logic is not created by God or man; rather, it is an attribute of God. It is not over God or independent of Him.

Logic is not devised by man, but neither is it created by God, like maple trees and dwarf stars are. Rather, it is an “attribute” of God which is reflected in creation. We need to be careful here, because it is not an attribute of God that is stated directly in Scripture, as His holiness, love, and righteousness are. But it is a characteristic of God that we see assumed everywhere in Scripture. We do not believe that logic is independent of God and over Him, which would mean that the triune God is not the sovereign God of the Bible. But neither do we believe that God could have created a nonsensical world where He was both the creator of it and not the creator of it. This leaves us with the assumption that all things are ultimately defined by God Himself, rather than by “rules.” Since we want to learn how to reason as faithful Christians, we begin by assuming that all faithful thinking and reasoning is somehow sharing in this characteristic of God. So when we study logic faithfully, we are studying some of the divine reflection in the world around us.

The Laws of Thought

Keeping all of this in mind, we must be careful when dealing with “rules” and “laws” of logic. In order to reason well, we have to assume

certain very basic things that never show up as particular items in our argument. They are simply (and quietly) assumed. For example, if you were putting together an argument about light bulbs or tricycles, it is very important that they not turn into something else (like toaster ovens or catcher's mitts) halfway through the argument. If they did, the argument would just have to lie down in the corner and sob quietly. It could never get anything done.

Traditionally, these assumptions have been called the "laws of thought." There is nothing wrong with the *contents* of these assumptions, but there is a significant problem with *another* deeper assumption lying beneath them. That assumption is that you can have laws without a lawgiver, and that ultimately, you can have reason apart from the triune God of Scripture. All you need to do, it is thought, is postulate some laws of thought and off you go.

Because this is the case, we want to begin by showing how the laws of thought are actually grounded in the nature of the triune God, revealed in Jesus Christ. After we have done that, we will be able to discuss the traditional terminology. The reason for doing this is that many modernists have been guilty of thinking that impersonal "laws" have authority in themselves, which of course they do not.

Let's start with the basic Christian confession that *Jesus is Lord*. When God reveals Himself in Christ, the decision that must be made is whether to believe it or not. These are the only two options: faith or unbelief. This means that the statement *Jesus is Lord* must either be true or false. A faithful person confesses that it is true. An unfaithful person denies it as false. God does not leave open the option of saying something like, "I believe that the higher reality of the lordship of Christ cannot be contained in our paltry categories of true and false, and so I cannot say whether I believe in Him or not." Such a response is simple dishonesty masquerading as humility.

The fact that *any statement is either true or false* is one of the three traditional laws of thought, upon which much of the science of logic is based. This law of thought is called the **Law of Excluded Middle**, because it excludes the possibility of a truth value falling somewhere in the middle between true and false. Statements are either one or the other. If a statement is not true, then it is false, and vice versa.



DEFINITION

The *Law of Excluded Middle*: Any statement is either true or false.



DEFINITION

The ***Law of Identity***: If a statement is true, then it is true.



DEFINITION

The ***Law of Noncontradiction***: A statement cannot be both true and false.

As Christians we confess that God is triune. If asked, we would say, “Yes, that is true. God is triune.” Now if it is true that God is triune, *then it must be true that God is triune*. This is an application of **The Law of Identity**, which simply states that *if a statement is true then it is true*. For ordinary people in ordinary conversation, such rules are not thought to be necessary. But when people are fleeing from God, they will often take refuge in any folly, arguing that the truth of a statement can change in the middle of an argument. This law may be employed to answer the unbeliever who says, “Christianity may be true for you, but not for me.” No. If the Christian faith is true, then it is true.

The third law says that *a statement cannot be both true and false*. This is called the **Law of Noncontradiction**. Without this law, we could not argue for the exclusive truth of any statement that we hold. We could try to assert, for example, that “Jesus is Lord.” But our opponents could respond, “Oh, I agree that what you say is true. But it is also false.” We see that if we deny these laws, we lose the possibility of all rational discourse.

Think for a moment what would happen to our faith if we were to allow someone to deny these fundamental assumptions. If we confess “God in three Persons, blessed Trinity,” someone who denied the Law of Excluded Middle could say that this wonderful confession is not true, and it is not false. It is just wonderful, and perhaps even a little inspiring. One who denied the law of identity could say, “Yes, it is true that God is a Father for you, but it is *my* truth that She is a Mother.” And one who denied the Law of Noncontradiction could say that God is our Father, and also, in the same way and in the same respect, He is not our Father. In other words, denial of these bedrock assumptions would make a hash out of the simplest Christian confession like the Apostles’ Creed.

Having said all this, there is an important warning. The Bible does assume that the Father is the Father, and not the Son. The Spirit is the Spirit and not the Father. The Father is not “not the Father.” At the same time, the Bible *also* teaches that the Father perfectly indwells the Son, the Son indwells the Father, and both with the Spirit are one God. Statements about the Father are not independent from statements about

the Son. Jesus said, “Anyone who has seen me has seen the Father.” These truths do not deny the laws of thought but rather support them.

Through a wooden application of these laws, some logicians have gotten to the point where they cannot understand or appreciate poetry, metaphor, sacraments, or marriage. The world is full of “in-dwelling” and mutual partaking, because this is *also* what our God is like. In our study of logic, we must always leave room for mystery. We know that the Father is Father, and no one else. We know as well that the Father is not the Son. But we should also know that the Father reveals Himself perfectly in the Son.

The Scope of This Book

The subject of logic may be divided into two main branches: **formal** and **informal**. Formal logic deals directly with reasoning, by considering the means of distinguishing between proper and improper modes of reasoning. Informal logic deals with operations of thinking that are indirectly related to reasoning, such as defining terms, relating terms to each other, and determining relationships between statements. Because informal fallacies are not formal methods of reasoning, they are also included under the branch of informal logic.

Formal logic itself may be divided into two main branches, **induction** and **deduction**. Induction deals with arguments of likelihood and probability. By induction we draw conclusions from facts or experience, conclusions which go beyond those facts. Inductive conclusions are never certain, but only probable. As such, they can be considered strong or weak, depending on how well experience supports the conclusion. They may also be strengthened by further experience. You can see that induction is the logic of the experimental sciences.

Whereas induction deals with arguments that are strong or weak, deduction deals with arguments that are valid or invalid. If valid, the conclusion follows from the premises, and it does so with certainty. A valid conclusion is one that is contained within the premises: if the premises of a valid argument are true, then the conclusion must be true. There are many branches of deductive reasoning. Two main branches are **categorical logic** and **propositional logic**. To the best of our knowledge, categorical logic was first developed as a science by



KEY POINT

Logic must always give way to mystery. For example, we understand many things in terms of poetry, or sacraments, or the in-dwelling of the Trinity.



DEFINITIONS

Formal logic deals with the proper modes of reasoning. **Informal logic** deals with operations of thinking that are indirectly related to reasoning.

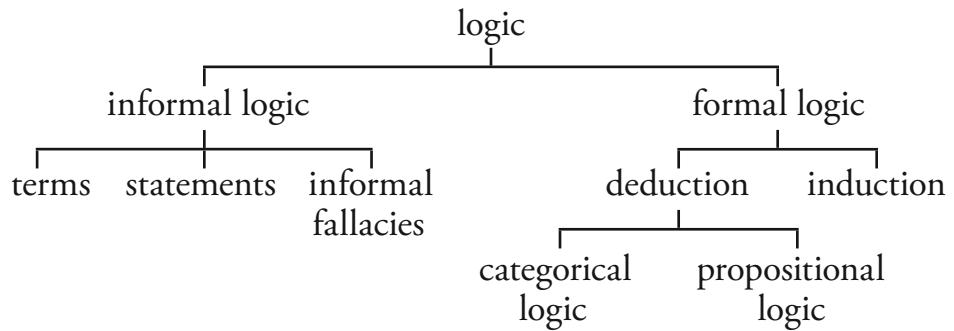


DEFINITIONS

Induction is reasoning with probability from examples or experience to general rules. **Deduction** is reasoning with certainty from premises to conclusions.

the Greek philosopher Aristotle (384–322 B.C.). Categorical logic deals with the **syllogism**, which is a type of deductive argument in which the conclusion connects one category (or term) with another, hence the name *categorical* logic. Propositional logic connects entire *propositions* together in arguments.

These branches of logic can be arranged as seen in the chart below:



This book is an introduction to the informal and categorical branches of logic. The next book in this series, *Intermediate Logic*, deals with the propositional branch of deduction. The point of all of this is to encourage students to begin the process of carefully “thinking God’s thoughts after Him.” The point of this book is *not* to teach us how to be quarrelsome with one another, nor to bring students to the false idea that the world is governed by some impersonal deity named Rules of Inference.

UNIT 1

TERMS AND DEFINITIONS

Contents

Lesson 1: The Purposes and Types of Definitions	9
<i>Exercise 1</i>	13
Lesson 2: Genus and Species	15
<i>Exercise 2</i>	19
Lesson 3: Extension and Intension	21
<i>Exercise 3</i>	25
Lesson 4: Methods of Defining	27
<i>Exercise 4</i>	31
Lesson 5: Rules for Defining by Genus and Difference.	33
<i>Exercise 5</i>	37
Unit 1 Review Questions	39
Unit 1 Review Exercises	41

THE PURPOSES AND TYPES OF DEFINITIONS

Introductory Logic, pp. 9–13

STUDENT OBJECTIVES

1. List and align the six purposes and five types of definitions and give examples.
2. Complete Exercise 1.

TEACHING INSTRUCTIONS

1. Read “Lesson 1: The Purposes and Types of Definitions” (*Introductory Logic* pp. 9–11) aloud with students. (Again, teach during or after the reading at your own discretion.)
2. Explain that **A term is a concept that is expressed precisely in one or more words.** A term is a verbal expression of an idea. Point to various objects around the room and make sure students understand that when you give these objects names they become terms, although the names are not themselves the terms. Explain that a single term can be expressed by many different words (e.g., *girl* and *puella* are two different words to describe the same term.) Also, one word can represent more than one term. Have students each write down their own definition of the word *mad*, and compare answers. Explain that the reason they all gave different definitions is that they are using the same word to describe different terms (e.g., *mad* can mean either “angry” or “crazy”).
3. Give the definition of *definition*: **A definition is a statement that gives the meaning of a term.** Tell students that what you are going to investigate today are the purposes of different

kinds of definitions, what they’re *for*. Explain that in this chapter you will be examining six purposes and five types of definitions.

4. Write **1) Definitions show relationships** on the board. Use the example in *Introductory Logic* of defining *man* as *a rational animal*. What relationships does this definition imply that the man has? Well, it implies that he is related to other rational creatures, like angels, demons, and God, but also to other animals, like walruses, kittens, and dung beetles. The definition ties a string between man and other stuff; it connects them.
5. Write **2) Definitions remove ambiguity** on the board. Ask students what it means that a word is “ambiguous,” and tell them that **Words are ambiguous when they have more than one possible meaning** (like the word “mad”). Explain that in lots of debates and arguments what the debaters get hung up on is definitions: they are using ambiguous words that mean something different to each person. When they finally define the ambiguous terms they have nothing left to argue about any more. Make sure students understand the book’s example about the definition of love: you don’t love your enemy the same way you love ice cream, or your baby sister. Explain that a definition that either shows relationships or removes ambiguity **by providing a single, established meaning of a term is called a lexical definition**, i.e., the kind you would find in a dictionary.

6. Write **3) Definitions reduce vagueness** on the board. Emphasize that ambiguity is similar to, but not the same as, vagueness: **A term is vague when its extent is unclear.** A term itself may have a straightforward meaning, but there may be situations in which it is uncertain whether the term applies. For example, we call a man *tall* if he is over six feet, but a tree would have to be much taller than six feet before we would call it tall; so the meaning of *tall* is vague. A precisifying definition seeks to make more precise what was previously vague or fuzzy. Clarify that precisifying definitions are not dictionary definitions; they apply only to the situation they are used in. If we use *tall* to describe 6'5" Harold, *tall* does not always and for everyone mean 6'5". Ask students whether nouns can also be vague. (They can. How old does a girl have to be before she is a *woman*?)
7. Write **4) Definitions increase vocabulary** on the board. Ask students for some vocabulary words they have recently learned in English class. Or grab a dictionary, open to a random page and choose a word no normal person would know (Even better, have a particularly good word picked out beforehand.) Read the word and definition to them and tell them that their vocabulary just grew. Explain that **a stipulative definition is a definition given to a brand-new-just-invented word, or to an existing word applied in a new way.** Look up some new words in a recent dictionary, such as *blog*, *to google*, and *woot*.
8. Write on the board **5) Definitions can explain concepts theoretically.** Explain that sometimes we give a definition for a word not because we don't know what the word means, but because we're trying to understand the term behind it better. Explain the book's example of H_2O . This is a theoretical definition: a definition given to a term that is not understood, usually scientific or philosophical. Explain that people give theoretic-

cal definitions to lots of concepts we don't fully understand, like *spirit*, *life*, even *God*. Explain that if you accept a theoretical definition, you accept the theory behind it; if you accept the definition of man as an evolved ape, you accept the theory of evolution.

9. Write on the board **6) Definitions can influence attitudes.** Go over the book's three definitions of *abortion* and have students explain how each definition is supposed to make them feel about the act of abortion. Explain that all definitions like this are **persuasive definitions: they aim at persuading the listener one way or another toward the term being defined.** Emphasize that persuasive definitions can be used for either good or bad. Have the students give some more persuasive definitions for *school*, *government*, and *cats* from different points of view.

ASSIGNMENT

Have students complete Exercise 1, and go over it with them.

OPTIONAL EXERCISE

Play the Dictionary Game (cf. Balderdash). Pick an unknown word from the dictionary, and read it aloud to everyone. Have each student make up a definition for the word and write it on a sheet of paper. Write the real dictionary definition of the word on another sheet of paper and mix it in with the made-up definitions. Read all the definitions aloud and have students vote on which they think is the true definition of the word. Remind students to be thinking as they play about what goes into writing a definition and what they are doing when they try to invent definitions for words or figure out what the definition of a strange word might be.