

Business Logic

Lecture 9: Deductive Reasoning Part 1

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Lecture Learning Objectives:

At the end of the lecture, you will be able to:

1. Differentiate the division of logic
2. Understand the properties of ideas
3. Explain the nature of term
4. Differentiate Absolute and Functional Extension
5. Explain Singular, Particular and Universal Terms
6. Understand the Nature of Judgment

As we have seen, a **deductive argument** is one whose premises are claimed to provide conclusive grounds for the truth of its conclusion. It is also viewed as a method of reasoning whereby it is shown that a particular case is true because it falls under some general law or principle, which is already assumed or known to be true.

Every deductive argument is either valid or invalid: valid if it is impossible for its premises to be true without its conclusion being true also: invalid, otherwise. The theory of deduction is intended to explain the relationship between premises and conclusion of a valid argument and to provide techniques for the evaluation of deductive arguments, that is, for discriminating between valid and invalid deductions. Suppose there is a doubt in our mind whether the **mimosa pudica**, due to its peculiar reaction to the touching of its leaves, possesses sentiency or no sentiency. And then suppose that science has definitely established the law that the nature of a plant is devoid of sentiency. We can now proceed with the following deductive argument.

All plants are devoid of sentiency;
Atqui, mimosa pudica is a plant;
Ergo, the mimosa pudica is devoid of sentiency

Such is the case of **deduction**. From a general law, the mind proceeds to conclude to a particular instance. The forms of argument under this case are the syllogism and its **modified forms** – the enthymeme, epichireme, polysyllogism, sorites dilemma, extra syllogistic inferences. Each of these classes will be treated lengthily. However, before treating the syllogism, we have to treat **first division** of logic which covers apprehension, idea, term and predictability. After treating the first division, we shall move into the **second division of logic** which covers judgment, enunciation, proposition and predication. The **third division** which covers reasoning, argument, syllogism and inference .

First Division

Apprehension – is the act of the human mind by means of which it knows the essence or nature of the thing without affirming or denying what soever. It is an act that is usually related with conceptual abstraction and presupposes it.

Ideas – that are expressed through elaborate definitions are the results of several simple apprehensions, several mental comparisons and even possibly of inferences or reasoning.

Properties of Ideas:

All ideas possess two important logical properties: **comprehension** and **extension**. The qualities are of paramount importance in mining the exact value of judgments and inferences and must, therefore, be thoroughly understood, if the mind were to proceed accurately, with ease, and with precision in the attainment of the truth.

1. **Comprehension**. The comprehension of an idea involves understanding of its meaning, signification, and thought content. We define it as the sum total of all the thought elements contained in an idea. It is also the sum total of the intelligible elements of the quiddity signified by the term or concept. These intelligible elements are referred to as **notes**. This **sum total** includes the basic elements that a thing has to have in order to be thought of as the kind of thing signified by the term. It also includes whatever is deducible from these basic connotation of the idea. It is manifested by definition.
2. **Extension**. The extension of an idea expresses the application of the thought content to the individuals and groups in which it is found. It is defined as the sum total of the individuals and classes or groups to which it is supposed to be applied. Extension is also known as **application or denotation**. It is manifested by division.

Relation between comprehension and extension. It is usually stated that comprehension can be neither increased nor diminished without changing the essence of the idea itself. **For example**, the comprehension of “man” as a “being” that is substantial, corporeal, living, sentient and rational can never be increased nor diminished. Adding an item to its comprehension or subtracting any of its component thought elements would alter the idea of man.

Logicians have another rule for the extension of an idea, namely: that it can be diminished or increased without destroying it. By this rule is meant that the comprehension of an idea can be applied to more or fewer individuals without any alteration in the idea itself. Thus, the idea of “man” will remain the same, whether it is applied to one or to a billion individuals. Tree may grow and multiply indefinitely, but the comprehension of “tree” does not change as a consequence.

Hence, the general truth of the rule is that: the **comprehension** of an idea always remains the same, while the **extension** of the idea may change continually.

There is another relation between the comprehension and extension of an idea which embodies another general truth, namely, that as the comprehension increases, the extension decreases: and as the extension increases, the comprehension decreases. We shall start with the idea of “living, corporeal substance”. The comprehension of this idea has three elements namely: “substance, bodily, and living”; its extension comprises all plants, brutes, and men. By adding the element, “sentient” to the original three elements, we have increased the comprehension, but at the same time we have narrowed the

extension because “plants” are now excluded since they are not “sentient”. The extension now includes only brutes and men. By adding the element, “rational” we have again increased the comprehension, but we have narrowed down the extension because we must then exclude brutes and plants, leaving only man. By adding, **for instance**, Manobo to the above-mentioned elements, we have again increased the comprehension, but we also narrowed the extension down to a Filipino cultural community living in the hinterlands of Mindanao.

A word of caution: We must remember that there is no strict arithmetical proportion in this inverse ratio between comprehension and extension. That would be wrong application of the rule. Not every increase of attributes in the comprehension of an idea will always diminish the extension.

Nature of Term

We shall say as much about the expression, **term** as is reasonably necessary for an elementary understanding of the proposition and of the meaning of term inference. The term, **term**, is defined from two points of view:

1. From the standpoint of its being a sign of a concept, and
2. From the standpoint of its being the ultimate structural element into which a proposition is resolved.

From the point of view of its being a sign of a concept, oral term is defined as an articulate sound that serves as a conventional or arbitrary sign of a concept. It comes from the Latin word “**terminus**” which means the last element into which a proposition may be broken down. Since **terms** are expressive of concepts, they are essentially signs. We may define **term** as a sensible, conventional sign expressive of a concept or idea. It may also be referred to as the spoken or written word expressive of a concept.

From the point of view of term’s being the ultimate structural element into which a proposition and argumentation can be resolved, it is defined as a word or group of words that can serve as the subject or predicate of a proposition. Thus, in the proposition, “All Muslims are believers,” the word “Muslims| and “believers” are terms - - “Muslims” is the subject, and “believers” the predicate.

Absolute and Functional Extension

The logical quantity of a **term** is determined by way of its absolute and functional extension. **Absolute extension** refers to all the subjects that the term signifies. This whole involves all that has the comprehension of a term, including all the things possessing it. The term “being” includes all existing entities, i.e., humans, trees, animals, tables. **Functional extension** deals with those subjects that are actually set before one’s thinking in using a term. If one thinks of a mountain, he is linking of a particular mountain, i.e., Mt. Apo or Mt. Mayon. If one links of all schools, he is linking of ADMU (Ateneo de Manila University), UP (University of the Philippines), Harvard, MG (Massachusetts Institute of Technology), Philippine Science High, and all others that are actually applicable to the said term.

Functional extension is divided into the singular, the particular, and the universal. If a term is singular, this means that the term is designated or applied only to one definite individual; particular if it is applied to more than one individual, without designating definitely; and universal, if it is clearly applied to all.

PROPERTIES OF A PROPOSITION

Singular, Particular and Universal Terms

A thorough understanding of the division of terms into singular, particular and universal is a necessary prerequisite to the study of inference. According to its **first meaning**, the extension of a term is the sum-total of the subjects to which the term can be applied. This is called its **absolute extension**. According to **second meaning**, the extension of a term includes only those subjects to which a term is actually applied in discourse. This is called its **functional extension**.

In the latter sense, the extension of a term is said to be **singular** if the term is applied to one definite designated individual or group; **particular**, if it is applied to an indeterminately designated portion of its absolute extension; and **universal**, if it is applied to each of the subjects to which it can be applied, that is, if it stands for each one of an unlimited class of subjects, or if its total absolute extension.

Quantity of a Proposition

The quantity of a proposition depends on the quantity of the subject term. A proposition is **singular** if the subject term is singular; a proposition is **particular** if the subject term is particular, a proposition is **universal** if the subject term is universal. Propositions like "Filipinos love their motherland" and "Asians hate Western food" are general propositions. They express something that is held true generally. General propositions, however, are not universal but particular. This is because exceptions will have to be admitted. The following are examples of singular, particular, and universal propositions.

Singular Terms. These are terms that expresses a concept, or a set of conceptual features applicable only to one individual or group. The designation of the individual or group is something definite. **Proper names** are singular; so are the demonstrative pronouns such as 'this' and 'that'. Superlatives, in the strict sense, are singular and so are common nouns. We also must take note that collective pronouns are singular if they stand for a definite group that they designate definitely, e.g., the Prophet of Islam, the University President, those five men, the team, the tallest girl, the Savior.

Examples of singular propositions:

1. The Philippines is the land of my birth.
2. Ramon Magsaysay was a great person.
3. My world is a mystery to an alchemist.
4. This day is very important for the two of us.
5. The largest planet in the solar system is Jupiter.

Particular Terms. These are terms that express only a part of the extension of a universal concept. They stand for an indeterminately designated portion of its absolute extension.

Examples of particular propositions:

1. Some children are victims of abuse.
2. An old house was torn apart.
3. A few students were listening to the lecture of Professor Giordano.
4. Many politicians are corrupt.
5. Several persons were arrested after the fiasco at JP's.

A term, therefore, is **particular**, first, if it stands for one individual or group without designating it definitely, and second, if it stands for more than one, but not clearly for all, of the individuals or groups to which it can be applied, e.g., some men, some Ilocanos, three rebels, several worms, a few sacks of rice, most Ilongos, a carabao, a farmer.

Universal Terms. A term is said to be **universal** if it refers to each of the subjects to which it can be applied that is, if it stands for each one of an unlimited class of subjects. It expresses a concept, formal feature, or nature that is applicable individually or distributively to the individuals of a certain kind.

Examples of universal propositions:

1. All men are equal.
2. A whale shark is a mammal.
3. Iguanas are not felines.
4. Every man is rational.
5. Whatever is beautiful is pleasing.

A term that is grammatically singular is not necessarily singular from the point of view of logic but might be particular or universal. A term that is used universally (that is, for each individual being as well as for each kind of being to which it can be applied) is said to be undistributed. **For example**, all T'bolis, an animal, every Maranao, each Christian, men without exemption, whatever is lighter than water, whoever is in this room.

Rule 1 — A term is singular if it stands for one individual or group and it assigns that individual or group definitely.

Examples include “My grandmother was a great person,” World War II was the most destructive war in history,” This government does not have a preferential option for the poor,” “I am not a believer of determinism,” and “The Holy Bible is a collection of books inspired by Christ’s life.”

If we examine the examples above, these terms correspond to a definite name, individual or entity. Demonstrative pronouns like “this” or “that” imply definite designation. Thus, terms like “that house” or “this umbrella” are singular since the objects to which the terms refer to have been designated definitely. Other examples implying singular extension include statements like “The greatest scientist” “The fastest car,” “The most intelligent mathematician at Fine Hall.”

Rule 2 — A term is particular if it stands for more than one, but not clearly for all of the individuals or groups to which it can be applied.

It can be said that a term is particular if it stands for an indeterminate part of the whole. Moreover, a term is particular if it stands for one individual without definite designation. Examples are “Some ideas are meant to improve our living conditions,” “A few good men were sent to Rwanda,” “Some men are committed to the common good,” “Several days are needed before Atlantis can be launched,” and “Many children are experiencing the pain of indifference.”

The words “a few,” “several” and “some” imply more than one individual, and clearly not all, henceforth, expressing particularity. In the statement, “A man is running at Elm St.,” the term “a man” is particular because there is no definite designation. It is not possible to determine from the statement a definite man one is referring to. On the other hand, in the statement, “My brother is aboard the biggest liner in the world,” the term “My brother” is singular because there is a definite designation of the individual being referred to in the statement.

Rule 3 — A term is universal if it stands for each of the subjects to which it can be applied.

For **example**, “Each person is entitled to his own opinion,” “Every Filipino desires to live well,” “All parents have dreams for their children,” “Nobody is born to cause harm to other men,” and “Everybody is expected to be present when the President arrives.”

If we take into consideration the examples above, to speak of each person means that one is referring to “all persons” without exception. The same can be said too to terms like “every Filipino,” “everybody,” “nobody,” and “all parents.” A universal term, since it is something that has absolute extension, is distributed. This means that a universal term is used to its extension without exception. The term “each person” is used to mean “all persons” implying that it is applicable to “all persons” or that it is distributed to all the subjects falling under the category “persons.”

The articles “a,” “an,” and “the” signal either particularity or universality. **For instance**, the term “a dog” is universal in “A dog is an animal” and particular in “A dog is

running.” The term “the golden shower” is universal in “The golden shower is a tree” and particular in “The golden shower was cut by Mr. Dumlao.”

Second Division

Ideas are considered as the raw material of knowledge, the building blocks of truth. But just as the raw materials are not the finished products and building blocks are not the completed edifice, so ideas as such are not an expression of the truth. By themselves, ideas are neither true nor false. They are neutral to truth and error. A million ideas may flash upon the human mind, like pictures shown on the video screen or movie screen, but truth will be absent until the human mind halts the two of them, compares and analyzes them, and expresses any agreement or disagreement between any of them. Only then will there be an expression of truth or error.

Nature of Judgment

Judgment is considered as the second act of the human mind. It is viewed as the cause of logical predication. We define it as the act of the mind affirming or denying one concept with another.

There are several prerequisites of judgment. These prerequisites must be fulfilled first before any judgment can be made. These are:

1. **Apprehension of the two ideas or concepts.** This means that the human mind must have an understanding of the two ideas about which it intends to make a judgement.
2. **Mental comparison of the two ideas or concepts.** Through this process, the mind studies the comprehension of each, recognizes their identity or non-identity and thus be ready to pronounce an agreement or disagreement.
3. Perception of the objective agreement or disagreement between the two ideas being compared with one another.
4. Pronouncement of the agreement or disagreement between the two ideas being compared.

Thus, it can be seen that there are **three elements** that enter into the composition of a judgment. These are: the **two ideas** and the **mental act** pronouncing their agreement or disagreement. One idea, the **subject idea**, has something said about it; and the other, the **predicate idea**, contains the something which is said about the other.

Truth and error lie in the judgment, there is no other act of the mind has this peculiarity that it claims to be true, although it is also equally true that, at certain times, judgment may be false.

The Ultimate Test of Truth

How do we know that our judgment is true? When it is false? There is only one criterion that also serves as the test of truth. And this is the agreement of judgment with reality. It is the congruence between what is in the mind and what lies in the objective world. We verify a judgment by comparing it with the reality it is supposed to represent. Every judgment given by the human mind, therefore, implies and presupposes the existence of reality. This implication of existence is known as the **existential import of the judgment**. This is the very thing that gives it objective value and truth.

Positive Abstraction and Negative Abstraction

There is another term for the judgment act of the mind. This term is called **mental composition and division**. In an affirmative judgment, the human mind unites or composes; in a negative judgment, the mind separates or divides.

As mentioned earlier, **abstraction** is found in the first act of the mind whereby it grasps or knows the essence of an object without affirming or denying it whatsoever. However, there is also another form of abstraction. This is the abstraction in the second act of the mind. In that form, the mind explicitly separates one concept from another. Abstraction of simple apprehension is called **negative abstraction**. On the other hand, abstraction of the negative judgment is called **positive abstraction**.

Formal truth or falsehood are not to be found in negative abstraction of simple apprehension but in the positive abstraction of negative judgment. Another name for abstraction is **precision** which may appear as negative or positive.

The Nature of the Proposition

The **proposition** is the basic unit of logical language. Understanding the nature of the proposition is necessary before one proceeds to the rules on inference. The proposition has been one of the concerns among great thinkers, notably Russell and Wittgenstein, and dismissed as a limiting concept by Martin Heidegger and G.W.F. Hegel, being a mere statement of fact.

Propositions do not tell us the ontological status of things. Such is the work of a metaphysician. Logically, propositions only reveal the truth condition of things, their state of affairs. Only factual conditions are revealed by propositions. The state of being of things, or the reality that they are such and such in essence, is beyond the task of logic. In logic, the **proposition** is essentially foundational, as all types of knowledge and scientific reasoning are structured in the form of a proposition. **Science** is the experimental validation of empirical hypotheses that take the form of propositions.

Having analyzed the nature of judgment as an act of the mind, we now turn our attention to its expression in words. Just as **ideas** are expressed in words which are called "**terms**", so also judgments are expressed in sentences which are called "**propositions**".

All **propositions** are sentences but not all sentences are propositions. A **proposition** must contain a judgment. This is not always the case with sentences. Considered the following sentences: "Caloy, can you spare a peso?" "Please remove your shoes upon entering this room." "Hurrah!" These sentences contain a question, a request, and a feeling of excitement: but they contain no straightforward judgment. Consequently, they have no room in logic.

A **proposition** is defined as a judgment expressed in a sentence ; or a sentence pronouncing the agreement or disagreement between two ideas. It is also a statement in which anything whatsoever affirmed or denied. It may be further defined as a discourse that expresses either truth or falsity. A **proposition** is the only kind of discourse that can be true or false in the strict sense, and every proposition is the one or the other.

There are many kinds of propositions but, for the present, we shall treat only the categorical proposition.

Definition of a Proposition

A **proposition** is restricted to two alternatives: true or false. A **proposition is true** if it affirms something, false if it does not. If we examine the statement "God is love," there is no empirical data that would affirm or deny the statement. The statement, in this regard, is a mere statement. It is not a proposition. It offers no knowledge about the world, and the state of affairs of things. Meaningfulness is based on factual content.

A **proposition is true** if it is a picture of a fact. It is **false** when it does not picture a fact. Its sense then comes from the fact that it pictures. Meaning is derived from the state of affairs of things. Thus, a proposition is a statement of fact. It expresses either truth or falsity. In form, a proposition is a declarative statement. Thus, the sentence, "Where is the far side of the moon?" is not a proposition. This sentence informs us nothing about the state of affairs of the world. Let us consider the following:

1. Are there rocks at the far side of the moon?

This is a sentence P.

P is a question about Q (rocks at the far side of the moon).

P says nothing about Q.

2. There are rocks at the far side of the moon.

This is a sentence P.

P is a statement about Q (rocks at the far side of the moon).

P says something about Q (rocks at the far side of the moon).

According to Alfred Jules Ayer, whose book, Language, Truth, and Logic, influenced the Vienna Circle, the movement popular for promoting logical positivism, examining a fact like the one asserted by the proposition above requires empirical verification, something that has been achieved by way of man's landing on the moon. The meaningfulness of the assertion is based on the empirical observation of such reality.

Thus, propositions are declarative statements about reality, for they purport to express facts. **Facts** refer to the state of affairs of the world, and propositions give us a picture of them.

Consider the following examples:

1. The earth is at least 4.5 billion years old according to the latest carbon dating.
2. Dinosaurs were extinct 65 million years ago.
3. Da Vinci was the creator of the Last Supper.
4. Cardinal Joseph Ratzinger was in charge of the Congregation for the Doctrine of the Faithful.
5. Jack Kilby was the inventor of the microchip.

Propositions express a fact. **Facts**, based on the above, are statements about the reality of the world. **Facts**, in this sense, inform us about what can be said about the world. What can be said about the world are the states of affairs of objects.

The Elements of a Proposition

A categorical proposition is defined as one in which a predicate (P) is either affirmed or denied of a subject (S). Basic to all propositions are **four elements**: the **subject term(S)**, the **predicate term(P)**, the **copula(C)**, and the **quantifier(all, no, some)** which specifies the quantity of propositions.

The **subject** is the term designating the idea or object about which the pronouncement is made. The **predicate** is the term designating the idea (thing or attribute) which is affirmed or denied of the subject. The **copula (“is”, “is not”)** is the term expressing the mental act which pronounces the agreement or disagreement between the subject and the predicate. The **subject and the predicate** of the proposition are the matters of the proposition while the **copula** always expresses the present act of the mind as far as it affirms or denies something at the very moment of judgment. Thus, it will always be represented by the present tense of the indicative mood of the verb “to be” and it, therefore, manifests itself in the words “is”, “is not”. Hence, in the proposition, “USM is a member of the PASUC,” the copula expresses affirmation; in the proposition, “Gov. Candao is the first governor of the Autonomous Region for Muslim Mindanao,” the copula “**is**” expresses another affirmation. On the other hand, in the proposition, “Marcos is not the first Ilocano president,” “**is not**”, expresses a negation.

Now, let us consider the parts of the proposition. The **proposition** consists of a **subject**, a **predicate**, and a **copula**. The **subject** is about which something is being affirmed or denied. The **predicate** is what is affirmed or denied by the subject. The **copula** is that which connects the subject and the predicate.

Let us take the statement "My Left Foot was the inspiring story of Christy Brown." In this example, the term "My Left Foot" is the subject. The term "the inspiring story of Christy Brown" is the predicate. Both terms are joined by the linking verb "was" The copula always has the form of a linking verb (am, is, are, was, were).

The **copula** serves to unite the subject and predicate in the proposition in its positive form. **For instance**, if we state, "Pluto is a dwarf planet," "Pluto" is joined with the idea of "a dwarf planet." On the other hand, the copula separates the subject from the predicate in its negative form, as in the example "The last King of France was not bald," expressing the fact that "The last King of France" was not "bald."

In terms of quality, propositions are either positive or negative. Propositions like "The rainbow is something that intrigues children" and "My love is real" are positive while propositions like "Anne Frank was not an American" and "Roosevelt was not a friend of Einstein" are negative.

Logical Form of the Proposition

Logical form refers to the arrangement of the parts of proposition. A proposition always follows the S (Subject) - C (Copula) - P (Predicate) or (S-C-P) structure. The following are possible forms of a proposition:

1. Su is Pp-A - Every teacher is a public servant.
2. Su is not Pu-E - All mammals are not dangerous.
3. Sp is Pp-I - Some viruses are virulent.
4. Sp is not Pu-O - Some planets are not light years away.
5. Ss is Pp-A - Donatello is an artist.
6. Ss is not Pu-E - Professor John Giordano is not a Thai.

It is necessary to re-word a statement in order to translate it into its logical structure. The missing copula must be supplied, a task that also requires identifying the subject of the proposition, so that one would not alter the logical sense of the statement. The rule is that one must not change the logical meaning of the statement.

1. He seeks nothing but glory. - He is a person who seeks nothing but glory.
2. Kitt Ludwig Conroy plays chess. - Kitt Ludwig Conroy is an individual who plays chess.
3. We must elect a responsible leader. - A responsible leader is one that we must elect.
4. I love the country of my birth. - I am a person who loves the country of my birth.
5. Hope springs eternal for every man. - Hope is something that springs eternal for every man.

As the above would show, re-wording a sentence in its logical form requires providing a copula, the reason being that the subject of the statement would be readily identifiable and as such, the predicate could easily be attributed to it as the copula is an indicator as to their unity when propositions are affirmative and separation when propositions are negative.

Quality and Quantity or Extension as Properties of the Proposition

All propositions have **two properties**, namely: quality and quantity. The quality of a proposition is manifested by the copula. It is the **copula** which makes the proposition either affirmative or negative. In the **affirmative proposition**, the predicated is affirmed of the subject; in the **negative proposition**, the predicate is denied of the subject. "Ants

are insects,” “A whale is a mammal,” “USM is a big university”: the **copula** affirms the predicate of the subject and consequently, the propositions are affirmative in quality. “No Muslim is a Christian,” “No book is useless,” “No catfish is a shark: Here the copula denies the predicate of the subject and consequently, the propositions are negative in quality.

The quantity of a proposition affects the whole judgment as a judgment; it expresses the number of individuals to whom the judgment or proposition applies. Since the predicate refers to the subject, the proposition is true of all the individuals contained in the extension of the subject. Using the quantity as the primary viewpoint, propositions are either universal, particular or singular, whichever way the subject is taken. Thus, the subject term determines the quantity of the proposition. A proposition is **singular** if its subject term is singular, standing for one definitely-designated individual or group; **particular** if its subject term is particular, standing for an indeterminately designated portion of its absolute extension and **universal** if its subject term is universal, standing for each of the subjects that it can be applied to.

READINGS AND VIDEOS (Please see the digital copies of the materials.)

Reading 1 Copi, I., Cohen, C & McMahon, K. (2014). Introduction to Logic Fourteenth Edition. London: Pearson Education Limited

Reading 2 Van Cleave, M. (2016). Introduction to Logic and Critical Thinking. Retrieved from <https://open.umn.edu/opentextbooks/textbooks/introduction-to-logic-and-critical-thinking>

Reading 3 Gensler, H. (2010). Introduction to Logic Second Edition. New York: Routledge

Video 1 Introduction to Formal Logic in
<https://www.youtube.com/watch?v=KcNESCrkliQ>

Video 2 Venn Diagrams and Categorical Syllogism in
<https://www.youtube.com/watch?v=GTDJ1HUcupo>

ACTIVITY AND ASSESMENT

Answer Exercise 1 & 2 (Write your answer in a separate sheet of paper)

REFERENCES:

Introduction to Logic

Irving Copi

Carl Cohen

Kenneth McMahon

14th edition, Pearson Education Limited, 2014

Logic for Filipinos 3rd Edition

Prisciliano Bauzon, National Bookstore 2013

Logic

Nolt, Rohatyn and Varzi McGraw Hill 2012

Critical Thinking

Noel Moore & Richard Parker

9th ed. McGraw-Hill, 2008

Elements of Logic: An Integrative Approach

Christopher Ryan Maboloc and Atty. Edgar Pascua II, Rex Bookstore Inc. 2008