DEPARTMENT OF PHILOSOPHY
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Course Guide for PHL 105: Introduction to Logic 1

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Unit 1 Meaning and Subject Matter of Logic

Contents

1.0 Introduction

This study unit introduces the learner to the meaning, main focus and subject matter of logic. It draws attention to the fact that logic is not just a subfield of philosophy but an indispensable tool of knowledge acquisition, hence essential for every human person.

2.0 Intended Learning Outcomes

It is expected that at the end of this unit, you will be able to:

1. clearly understand the distinctive subject matter of logic and the principles of reasoning that are part of logic;
2. analyze arguments into its premises and conclusion and their roles in an argument;
3. identify the premise(s) and conclusion identifiers in any given argument.

3.0 Main Content

3.1 What is Logic?

Logic, in its most basic sense, deals with sensible rational thought, that is, how ideas reasonably fit together. In other words, when you apply logic, you must be concerned with analyzing ideas and arguments by using reason and rational thinking, not emotions or mysticism or belief. As an academic discipline or field of study, however, logic is conventionally and historically, regarded as one of the major subfields or core divisions of philosophy. Logic is thus primarily an integral part of philosophy. Notwithstanding, however, the fields of mathematics and computer science provide professional training in logic. Indeed, *all* academic disciplines employ logic: to evaluate evidence, to analyze arguments, to explain ideas, and to connect evidence to arguments. One of the most important uses of logic is in composing and evaluating arguments.

As a subfield of philosophy, logic stands on the same pedestal with the other core philosophic specialisms, namely metaphysics, epistemology and axiology. In this context, logic is held to be ultimately concerned with the question of truth and on this

score, is usually associated with epistemology; both deal with ultimate truth. But there *is a current in philosophy according to which logic is not,* properly *speaking a sub-division of philosophy.* The best way of stating the relationship, according to this current, is to say that logic is a *propaedeutic* to philosophy, that is, a preliminary study that helps to prepare the way. It is argued, in this connection, that logic is the beginning (more aptly put, the *soul*) of philosophy, indeed of knowledge as a whole; for if we do not get logic right, we shall get nothing else right. "If truth is to be sought in every division of knowledge", we must, Sextus Empiricus say, "before all else, possess truth-worthy principles and methods for the discernment of truth." And for him, logic is the only endeavour that both consciously and primordially includes "the theory of criteria and proofs, so it is with this that we ought to make our beginnings". The point here is that logic is prior to all aspects of knowledge. Before embarking on the study of any science, one should, Aristotle says, receive some training in logic. This is what Aristotle meant, when he called logic an *Organon* (that is instrument). It is an instrument of knowledge. Logic is, thus, central not only to philosophy, it is an indispensable ingredient of philosophy, indeed of knowledge acquisition. Gottlob Frege echoes this point when he avers that "to discover the truth is the task of all sciences; it falls on logic to discern the laws of truth." It is also unarguable that nothing indeed can be learned in the colleges and Universities than the principles of good reasoning and how to acquire and process information intelligibly; no matter what we claim to know it is only useful if we are able to communicate such knowledge systematically and coherently. Notably, it is only logic that deals in its subject matter with consistent, systematic and logical reasoning. Logic in its primordial sense has to do with the universal laws of reasoning, which can be applied to the particular arguments of all the sciences.

Indeed and remarkably, logic with grammar and rhetoric (the *trivium*) constituted the core liberal arts, that is, subjects or skills that in classical antiquity were considered essential for a free person (*liberalis*, "worthy of a free person") to know to take an active part in civic life, hence compulsory for everybody in the ancient programme of higher education in Western history.

Etymologically, the English word logic comes from the Greek word *"logos"* usually translated as *"word"*. In essence, the terms "logic" and "word" have the same Greek root, *logos* and when we take what the New Testament Gospel of John 1:1-4 says, to wit: "*In the beginning was the **Word,** and the **Word** was with God, and the **Word** was God. The same was in the beginning with God. All things were made by him; and without him was not anything made that was made. In him was life; and the life was the light of men"* we discover that really logic and God are synonyms, both have the implication of an underlying structure or purpose. God, in most revealed religions, is usually introduced as an underlying structure for all that is. Correspondingly, logic is an ordered and systematic facility, an underlying structure that gives coherence and consistency to our manifold and fragmentary experiences. When therefore Aristotle says that logic is an *Organon*, what is meant is that logic is an instrument of thought, that is, that human experiences are organized, analyzed and sustained by a certain intrinsic constitutive element. This element has a logical nature since it guarantees a homogeneous, coherent, systematic and ordered conception of reality.

As an activity that deals with the consistency and coherence of our ideas, logic is commonly defined as *the principles of correct reasoning*. This is a provisional definition, because how logic should be properly defined is actually quite a controversial matter. However, for the purpose of this introductory course, we consider it useful to give at least some rough idea as to the subject matter that we will be studying. One thing to note however about our provisional definition of logic as the principles of *correct* reasoning is that studying the correct principles of reasoning is not the same as studying the psychology of reasoning. Logic as a discipline deals with the former; it tells us how we *ought* to reason if we want to reason correctly. Whether people actually follow these rules of correct reasoning is an empirical matter, something that is not the concern of logic.

The psychology of reasoning, on the other hand, is an empirical science. It tells us about the actual reasoning habits of people, including their mistakes. A psychologist

studying reasoning might be interested in how people's ability to reason varies with age. But such empirical facts are of no concern to the logician.

One might ask so what are these principles of reasoning that are part of logic? There are many such principles, but the main (not the only) thing that logic is concerned primarily with is the correctness of the completed process of reasoning. Logic is interested in whether certain conclusions follow from some given assumptions; that is, whether the reasons (in logic parlance, premises) provided for our claims (in logic parlance, conclusion) are adequate or suitable (good reasons) for making such claims? If the reasons provide adequate information or grounds for the claim, that is, asserting the reasons (premises) to be true does warrant asserting the claim (conclusion) to be true, then the reasoning is correct (in logic parlance, valid). If on the other hand, asserting the premises to be true does not warrant asserting the conclusion to be true, then the reasoning is incorrect (in logic parlance, invalid).

4.0 Conclusion

Logic as an integral part and branch of philosophy deals with the study of reasoning. Hence, it is sometimes referred to as the science of reasoning. The understanding of the subject matter of logic will expose man to how to identify correct or good reasoning from the bad one.

5.0 Summary

In this unit, you have been introduced briefly to the meaning and nature of logic. It is that branch if philosophy concerns with the separation of good reasoning from bad ones and attempt to ensure that human reasoning conform to the principle of reasoning. That is a state where the reason(s) of premise(s) provided adequate support to the conclusion.

6.0 Tutor Marked Assignment

1. Explain the distinctive subject matter of logic and the principles of reasoning that are part of logic.

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Unit 2 Subject matter of Logic and its Components

1.0 Introduction

This study unit introduces you to the various subject matter of logic and its components. The unit focuses on arguments as the distinctive subject matter of logic, premises and conclusion as the components of an arguments and on the words or phrases that helps in identifying the premises and conclusion of an argument.

2.0 Intended Learning Outcomes

It is expected that at the end of this unit, you will be able to:

1. analyze arguments into its premises and conclusion and their roles in an argument;
2. identify the premise(s) and conclusion identifiers in any given argument.

3.0 Main Content

3.1 Subject matter of Logic and its Components

From our discussion in unit 1 of this Course Material, it was clearly stated that Logic is concern with the correctness of argumentation. This means that the distinctive subject matter of logic is *arguments*. Indeed in its creative usage and for all practical and intellectual purposes and usages, logic is concerned with arguments. And it is remarkable that argument is central to our existence as human beings. At home, in the market places, in our offices and at school, indeed in everyday life, argument is one of the main ways we exchange ideas with one another. Suffice it to say that all people, including you, make arguments on a regular basis. When you make a claim and then support the claim with reasons, you are making an argument. Academics, business people, politicians, scientists, and other professionals all make arguments to determine what to do or think, or to solve a problem by enlisting others to do or believe something they otherwise would not. Not surprisingly, then, argument dominates everything we do as humans hence essential for our training in life engagements especially as learners.

3.2.1 Arguments

In everyday life, we often use the word "argument" to mean a verbal dispute or disagreement. This is not the way this word is usually used in logic. When people disagree each person ordinarily attempts to convince the other that his or her viewpoint is the right one. Unless he or she merely resorts to name calling or threats, he or she typically presents an *argument for* his or her position. In this context, that is, in logic, "arguments" are those statements a person makes in the attempt to convince someone of something, or present reasons for accepting a given position. An argument is thus not the same thing as a quarrel. The goal of an argument is not to attack your opponent, or to impress your audience. The goal of an argument is to offer good reasons in support of your position, reasons that all parties to your dispute can accept. Nor is an argument just the denial of what the other person says. Even if what your opponent says is wrong and you know it to be wrong, to resolve your dispute you have to produce arguments. And you haven't yet produced an argument against your opponent until you offer some reasons that *show* him to be wrong

Therefore, to argue means to put forward or proffer reasons for or against something (idea, opinion, view). An argument is, thus, said to have taken place

whenever one constructs a chain of reasoning(s) in support of a viewpoint or position. In consequence, an argument or argumentation involves the provision of reasons in support of a viewpoint. What is clear from this standpoint is that an argument, in a formal or technical sense, is not understood in the pedestrian sense, according to which the term connotes in its meaning disagreement, controversy, or even verbal quarrelling. An argument is accordingly defined as *any set of statements (propositions) some of which (the premiss(es) purport to provide reasons for accepting one of them (the conclusion).* That is, in an argument we usually have a set of statements (propositions) constructed in such a manner that one follows from or implied is by the other(s). When we use the word "argument" here, therefore, its use has nothing to do with quarreling, fighting, or disagreement. An argument is simply a set of statements, one of which is designated as a conclusion and the remaining statements, called premises, are offered as evidence or justification that supports or implies the conclusion.

It is also instructive to distinguish an argument from a debate. A debate is really a series of arguments usually, but certainly not always, about a single topic or a set of related topics. A debate may be a formal debate such as the presidential debate or the debate held between two scholastic debating teams. A debate may be an informal debate during, for instance, a dinner party or a public hearing where rules of debate are not enforced. The point is that a debate always involves argumentation but an argument itself is not and does not involve a debate.

3.2.2 Premiss (es) and Conclusion

The statements (*propositions* in logic parlance) that are used to proffer reasons which support or provide evidence on the basis of which, we are enabled to assert a position or another proposition are called *premiss(es).* The word premiss itself comes from the Latin *praemisus* (plural *praemissa*) meaning “placed in front”. This etymological definition supports our use of the spelling "*premiss*" and "*premiss(es)*" rather than "premise" and "premises”. "Premises" is a lawyers' term of art meaning "real estate", which captures a French legal term meaning “aforesaid” that only came to be used (usually in the plural) to refer, rather legalistically, to property (and its

appurtenances), in such phrases as "to occupy the premises" and "to vacate the premises." The confusion over the spelling arises from the fact that the premises of an argument are traditionally laid down *before* the conclusion, so they are also "aforesaid," in the same sense as the description of property on a legal document. Although both spellings are ordinarily used, "*premise*" and "*premises*" are more correct and indeed preferred in logic.

In this etymological sense and indeed its more correct usage, premises are statements usually put forth as part of an argument, they constitute the reasons on the basis of which we establish or arrive at new set(s) of information. In the sense of this characterization, in arguments such as:

1. (a) All lawyers are liars
   (b) All liars are unreliable
   (c) Therefore, all lawyers are unreliable

statements *(a)* and *(b)* are premiss(es); they provide the information on the basis of which statement *(c)* is arrived at.

Statement *(c)* of 1 is called the *conclusion* or *main claim*; it is arrived at or its truth is established by statements *(a)* and *(b)* of 1. The conclusion (of an argument) is, therefore, the proposition that is affirmed or asserted based on the information or reason(s) provided by the premiss(es). In effect, in making arguments, propositions are patterned into premiss(es) and conclusion such that the premiss(es) provide evidence, reasons or support for the conclusion that is main claim; the conclusion is affirmed or asserted based on the evidence or reasons provided by the premiss. The import here is that the propositions identified as the premiss(es) of an argument are the reasons for accepting the conclusion of the argument.

Arguments may be as short as a single sentence or as long as a book. Every argument, however, must (by definition) have a conclusion. The conclusion is the claim that is argued *for*. Both premiss(es) and conclusion must be *statements*, that is, claims that are either true or false (whether or not we know which). *Questions*, in particular, cannot be premiss(es) or conclusions. In the sense of "argument" and "arguing" (offering an argument) we are using here we would not say "John was arguing whether God

exists"--or at least if we did say this we would not be identifying the conclusion of his argument. "Who caused the world?" is not going to be a premise or conclusion of any argument, because it is not a statement. Nor is a question of the form "Who is to say that ...?" Premises are claims that support the conclusion. Questions may be used to *suggest* claims, of course. Indeed this is so often done for effect in debate that such questions are known as "rhetorical questions." Thus a debater might say "Would you want to be governed by the military? Well, then you should support a strong defense." But insofar as there is an argument here, the premise is not the *question* “would you want to be governed by the military?” but the *answer* that the debater is presuming you would offer (silently) in reply to the question, namely that you would not want to be governed by the military.

In an argument, the conclusion, which is the main claim is normally supported by its two or more premiss(es). In this sense, the premiss(es) are reasons or statements of support for the main claim. It is this support provided by the premiss(es) that make the conclusion something more than mere assertions. In this regard, the premiss(es) or reasons are statements in an argument that pass two tests: 1. the answers to the hypothetical challenge to a claim: “Why do you say that?” “What reason can you give me to believe that?”, and 2. a link to the claim, an indication of the reason (usually using the word because or its equivalent).

If the premiss fail to address the hypothetical challenge or the 'because' tests, there is something wrong with the logic of the argument. The import here is that the reasons or premiss(es) of arguments themselves need to be supported in a number of ways.

Here are some ways that the premiss of an argument itself can be supported:

(1)***Assumptions***: Eventually, all support for premiss(es) can be traced back to a set of beliefs which the person making the argument considers to be self-evident, and therefore not in need of further support or analysis. These may be called assumptions, presumptions, suppositions, or, in certain situations, postulates and axioms. Such

assumptions serve as the premiss(es) for supporting arguments and, in general, any premiss can be called an assumption.

(2) ***Evidence***: A premise can be made more acceptable when it is supported by various kinds of evidence: statistical studies, historical information, physical evidence, observations, or experiments, eyewitness accounts, and so on. Statistics include raw numbers (3 million candidates registered for JAMB), averages ('women bowling teams drink on average two pitchers less then men's'), statistical probabilities ('travelling by train reduces chances of accident by 70%'), and statistical trends ('kidnappings have risen 60% over the past three years'). Generally, statistics have the advantage of seeming objective, authoritative, and factual, but critical audiences will want to know about the sources and methods for determining your statistical evidence.

The relative strength of evidence is determined by how reliable a person believes it to be. Almost no evidence is beyond dispute – we might challenge the methodology of a study, the accuracy of the information, the manner in which physical evidence was collected, and the eyesight or motivation of an eyewitness. And remember that the evidence only supports the premiss(es) – evidence cannot be an argument itself.

(3)***Testimony from an Eyewitness***. Eyewitness or first-hand testimonies are reports from people who directly experience some phenomenon. If, for example, one is arguing about toxic waste dumps, a quotation from someone living next to a dump would fall into this category. First-hand testimony can help give the audience a sense of being there. Experts may also rely on direct experience, but their testimony is also backed by more formal knowledge, methods, and training. Supplementing the neighbor's account with testimony from an environmental scientist, who specializes in toxic waste sites, is an appeal to expertise or authority.

(4) ***Authority***: Sometimes, we are not in a position to judge supporting evidence for ourselves: there may simply be too much of it, or it may be too technical in nature, or it may not be directly available to us. In those cases we often rely on the judgments of others, authorities whom we believe to be more likely to come to an accurate evaluation of the evidence than we are ourselves. Though we tend to think of such expertise in

scientific, medical, or other scholarly fields, authority in arguments can also come from religious teachings, folk wisdom, and popular sayings – anything or anyone that we accept as somehow able to reach a more accurate evaluation. The relative strength of an authority in an argument depends on how willing a person is to accept the judgment of that source, but even in the strongest of cases, use of an authority merely supports a premiss, and does not make an argument by itself. In fact, when using expert testimony in arguments, you should always make sure the authority you are appealing to is in fact qualified to speak on the topic being discussed.

(5) ***Explanations and Anecdotes***: Sometimes, we are more willing to accept a premiss if we are given background information or specific examples. Such explanations and accounts are not given the importance of evidence or authority in an argument. Anecdotal evidence, for example, is by definition less statistically reliable than other sorts of evidence, and explanations do not carry the weight of authority. But both anecdotal evidence and explanations may affect our **understanding** of a premiss, and therefore influence our judgement. The relative strength of an explanation or an anecdote is usually a function of its clarity and applicability to the premiss it is supporting.

(6) Specific instances include examples, case studies, and narratives. Each can be an effective mode of building support for a reason or claim. Specific instances offer a way to see an idea illustrated in a particular case. To be effective, specific instances need to be representative of the broader trend or idea they are supporting. With an example as evidence, someone arguing against seat belt use might say "Last year my cousin crashed her car off a bridge and would have drowned if she were wearing her seatbelt" as evidence (the answer to "Why do you believe that?" question.) An opponent might challenge whether this example was a representative one: surely there are many more car crashes that do not end in water, so this one instance is not a fair gauge of the relative safety of not wearing.

The various sorts of support for a premiss supporting arguments, *assumptions*, *evidence*, *authority*, and *explanations and anecdotes etc.* – interact in what we might call a ***hierarchy of support or evidence***, in which one sort is given priority over another. In a

murder trial, for example, the prosecution is usually based on the assumption that the court's hierarchy of evidence will have at the top physical evidence (fingerprints, blood samples), especially as explained by technical authorities (forensic pathologists, ballistics experts), followed by eyewitness accounts, then by other sorts of authorities (psychologists, sociologists), and finally by explanations and anecdotes (character witnesses, personal histories). If the prosecution is right, their strong physical evidence and eyewitness accounts will outweigh the defendant's character witnesses, because of their relative placement in the court's hierarchy of evidence. However, because that hierarchy is determined by the judge on a case-by-case basis, one can never be totally sure how any one piece of support will be accepted.

Propositions, premiss(es) and conclusion are however, the basic components of an argument. Both premiss and conclusion are themselves propositions, which are, however, distinguished by virtue of their role(s) in an argument; *premiss(es) are those propositions which are used to provide reasons in and for an argument,* while the *conclusion is the proposition asserted, warranted or established by the reasons provided in the premiss(es).* Premiss(es) and conclusion are accordingly integral parts of an argument. In the following arguments:

2. (a) All Centre-leftists are radicals
   (b) All radicals are democrats
   (c) Therefore, all Centre-leftists are democrats.

3. (a) If Nigeria is an oil-producing country, then Nigeria is wealthy
   (b) Nigeria is an oil-producing country
   (c) Therefore Nigeria is wealthy

(a) and *(b)* of 2 and 3 respectively are the premiss(es) and *(c)* in each instance is the conclusion, that is, *(c)* is the inference drawn from the earlier propositions in both arguments. In both examples, also, propositions *(a)* and *(b)* respectively, which are identified as the premiss(es) are the reasons for accepting the conclusions.

However, the point is important that arguments are not always patterned as per examples 1, 2 and 3. In some cases, the conclusion of an argument may occur as the first proposition. The conclusion may also occur in the middle of an argument. There are also arguments, which are such that they consist of several premiss(es) from which a single conclusion is drawn. **The point that comes to a relief here(s) or the conclusion of the**

argument. The determination as to which propositions are the premiss(es) or the conclusion is a function of identifying which set of propositions that provide support or reasons, and which of them are asserted or follows from the reasons or evidence provided.

3.2.3 Inferences

The reasoning process which is employed in evaluating arguments such that one moves from the information provided by or in the premiss(es) to assert certain claim or information in the conclusion is called *inference*. In this sense, inference rightly is what enables us to make propositions about the unknown using the known as their foundation; it is inference that allows us to transit from the premise, (which constitute the evidence for the establishment of) to, the conclusion.

We may infer from the dressing and conduct of lady that she is a sex worker; we may infer from a person's demeanour, dressing and attitude that he/she is a Muslim; we may infer from the nature of the debris that it is a building razed by fire; we may infer from a man's calloused hands the nature of his occupation; we may infer from a pastor's denomination and speech that he is tolerant of gay marriage; we may infer from the sound of an engine the condition of its connecting rods. Inferences may be carefully or carelessly made. They may be made on the basis of a broad background of previous experience with the subject matter or with no experience at all. For example, the inferences a good mechanic can make about the internal condition of a motor by listening to it are often startlingly accurate, while the inferences made by an amateur (if he tries to make any) may be entirely wrong. But the common characteristic of inferences is that they are statements about matters which are not directly known, statements made on the basis of what has been observed." (Hayakawa, S.I., 1972)

Consider the following example:

Suppose that Aisha visited Hakeem and upon entering the room, Hakeem shut the door and within some splits of minutes, Aisha began to scream. When people came to the direction of the scream, Hakeem believably refused to open the door, and upon forcing the doors open Aisha's dresses and pant had been torn and she is seen crying. The inference ordinarily is that Hakeem was attempting to, or perhaps has indeed, raped Aisha.

In the above example, although the fact that Hakeem was attempting to rape Aisha is not given; the inference is drawn consequent upon the reasoning based on the observed state of affairs, that is, the given in experience.

Inference is thus the endpoint of reasoning; it is the process that enables us to arrive at (infer) a conclusion on the basis of the premiss(es) which constitute both the

starting point of the process and the evidence for the establishment of the former proposition.

However, there is no doubt that inference as a process of reasoning is an important category in evaluating arguments, but the logician's interest is not in the process of inference. The logician is interested in the propositions that are the initial and endpoints of that process, and the relationships between them. Inference is thus not a component or part of an argument; it is only a process to which corresponds an argument.

If you examine our examples above, you understand that "making an inference" is a *psychological process,* yet an inference is the reasoning process by which a logical relation is understood. The logical relation is considered valid (good) or not valid (not good) even if we do not understand the inference right away. In other words, it is convenient to consider the logical relation as not being dependent for its validity on the psychological process of an inference. In this manner, logic is not considered as "the science of reasoning." It is prescriptive, as already adumbrated. So, this logical relation between the premiss(es) and conclusion of an argument holds regardless of whether we pay attention or not.

The point that the logical relation between the premises and conclusion of an argument does not depend for its validity on the psychological process of an inference is brought into prominent relief if we consider the following example of an argument:

If professionals and intellectuals are continuously edged out in the electoral process, then the apparatus of government will keep on to be in the hands of charlatans.

If the apparatus of government is kept on in the hands of charlatans then good governance will persist only as a pipe- dream.

If good governance persists only as a pipe-dream, then this country will remain perpetually vulnerable both economically and in infrastructure.

Therefore, if professionals and intellectuals are continuously edged out in the electoral process, then this country will remain perpetually vulnerable both economically and in infrastructure

The logical relation between the premiss(es) and the conclusion of the above argument can be symbolized as follows:

$P \supset A$

$A \supset G$

$G \supset V$

$P \supset V$

This logical relation that exists between the premiss(es) and the conclusion of an argument is called an entailment. An ***entailment*** is a logical relation between or among propositions such that the truth of one proposition is determined by the truth of another

proposition or other propositions, and this determination is a function solely of the meaning and syntax of the propositions concerned.

Another way to remember the difference between an inference and an entailment is to note that people *infer* something, and propositions *entail* something.

3.2.4 Inference Identifiers

The language in which an argument is presented often contains words or phrase to help identify its parts, especially its premises and conclusion. These words and phrases are **identifiers** of the function played in the argument. Unfortunately, identifiers are only as precise as the persons using them, and both the individual making an argument and the one evaluating it are liable to make mistakes by inexact or sloppy use of identifiers. Since the purpose of an argument is to communicate an idea clearly, the careful use and interpretation of identifiers is an important skill for critical thinking.

The following are some of the most common premise and conclusion identifiers:

Premiss identifiers

since	for	because
in that	seeing that	given that
may be inferred from	the reason is that	as indicated by
inasmuch as	as	owing to
by reason of	follows from	may be derived from
supposing that	may be deduced from	in view of the fact that
as shown by	supposing that	for the reason that

Conclusion identifiers:

therefore	thus	so
as a result	consequently	we can conclude that
it follows that	hence	accordingly
In consequence	wherefore	whence
which means that	as a result	we may infer that
proves that	it must be that	the upshot is that
implies that	which allows us infer	conclude that
In conclusion	which implies that	which points to
which shows that	entails that	for that reason

Though our list is not exhaustive, it is notable that while these words and phrases may help in spotting an argument, yet it is instructive that not all conclusions are preceded by these conclusion indicators, and not all statements preceded by these words and phrases are conclusions. Again, not all premiss(es) are introduced by premiss

indicators, and these same words and phrases sometimes serve functions other than introducing premiss(es). "Because" frequently appears in explanations, and there is a use of "for" as a preposition, a use more common than its use as a premiss indicator. Similarly, "since" commonly functions as a preposition concerning duration of time rather than as a premiss indicator. Notice also that "for" not only indicates that a premiss is coming, but that what has just been stated (before the word "for") is the conclusion (whether intermediate or final). Some of these words can also appear within the context of an argument, but without indicating an inference. "So," for example, have several meanings, only one of which is a synonym for "therefore."

Sloppy usage may also produce confusing identifiers. A common answer to the question, "What would you think if the sky suddenly clouded up and turned very dark," is "I would assume it was going to rain." Yet "it is going to rain" here is a *conclusion*, not an assumption or premiss. "If" and "then" are often used to identify premiss(es) and conclusions, respectively. However, "if" and "then" are also used to introduce the two halves of a conditional premise. In either usage, “then” is sometimes omitted; or it has other meanings, as well. An identifier may not immediately precede or follow the word or phrase whose function it is indicating. For example, in the sentence "Thus, whenever the sun rises, the rooster crows," there are two claims: a premiss, "the sun rises," and a conclusion identified by "thus" (but not immediately following it), "the rooster crows." In cases where there are no identifiers, the most frequent order is *conclusion first*, followed by one or more premisses. If more (say two) premises are given, they are often conjoined with "and" or "but." For example, "I like Handel. I like most classical composers, and Handel was a classical composer."

Because arguments are attempts to provide evidence or support for a certain claim, they often contain these “indicators" which no doubt aid in the task of identifying the conclusion of the argument, which often comes last in the series of statements making up the argument, as we have illustrated in our examples above, but which we have noted earlier can also come first, or even in the middle, such as in these examples:

> *Amarachi is the most qualified person for the job*. This is because she has the best academic credentials and proven track record of competence of all the candidates, and she will not place the interests of trade unions above those of the establishment.
>
> Callisto orbits Jupiter. Hence, *it is not a planet*, because something must orbit a star in order to be a planet.

In the examples above, the italicized statements are the conclusions. The other statements are offered as reasons or justifications for these claims.

4.0 Conclusion

Argument is the distinctive subject matter of logic. It is a set of proposition that can be structured into two parts, namely premise and conclusion. The premise is that which provides reason(s) for the acceptance of the conclusion, which is the claim in the argument. Thus, the premise(s) contained information or grounds that makes the conclusion to be either true or false.

5.0 Summary

The distinctive subject matter of logic is argument and the components of arguments are premisses and conclusion. Whereas the premises provide support or reasons for the main claim of an argument, the conclusion (which is the main claim) is asserted based, or follows from, the reasons or evidence provided by the premises. The psychological process which though not part of the argument but enables us to transit from the premises to the conclusion is called inference and there are words and phrases whose role in the argument helps to identify the premises and the conclusion of the argument.

6.0 Tutor Marked Assignment

Identify (i) the premiss(es), (ii) the conclusion, and (iii) the premiss(es) identifier and/or conclusion identifier in each of the following arguments.

1. The orchestrated war against corruption by the Obasanjo administration is a colossal failure, because the revelations arising from the sale of NITEL and the refineries clearly show that Mr. President himself was wantonly corrupt; he only used the Economic and Financial Crime Commission (EFCC) to harass and intimidate his perceived political enemies.
2. God is a rational impossibility, so theologians and apologetics who try to prove God's existence end up with psychologically and emotionally persuasive arguments.
3. Malaria attack involves a loss of appetite because oftentimes appetite for patients infected with malaria parasites usually drop noticeably some days before malaria is actually diagnosed.
4. Since the law of averages dictates that only 10% of students are absent due to illness, and more than 10% are absent, it follows that some students absent today are unprepared for this quiz.

5. No one has directly observed a chemical bond, so scientists who try to envision such bonds must rely on experimental clues and their own imaginations.
6. Since chick embryos support human-cell growth and can be monitored through a window cut into their shells, they are frequently used for studying cancers that grow in people.
7. For there was a never proud man thought so absurdly well of himself, as the lover doth of the person loved; and therefore it was well said, that it is impossible to love, and to be wise.
8. Mystery is delightful, but unscientific, since it depends upon ignorance.
9. The graphical method for solving a system of equations is an approximation, since reading the point of intersection depends on the accuracy with which the lines are drawn and on the ability to interpret the coordinates of the point.
10. If you speak any lines, or do anything, mechanically, without fully realizing who you are, where you came from, and what you will do when you get there, you will be acting without imagination. Therefore: Every movement you make on the stage, every word you speak, is the result of the right life of your imagination.
11. Analysis of the technical report on the last general elections indicate that electoral violence is at the very root of low voters turnout, and it has also been established t hat

    imposition of candidates by political parties leads to boycott of elections by the electorate. Hence, it follows that voters' apathy is caused by electoral fraud because electoral violence and imposition of candidates are indices of electoral fraud.
12. You have been learning much more about sentence structure, because the types of sentences you use are quite varied and I have noticed that your essays are quite sophisticated.
13. Since either accent or duration by itself can produce rhythm, it is axiomatic that both may be combined to produce rhythm.
14. The fight against corruption in Nigeria has continued to fail because the respective Presidents have always been selective and partisan in prosecuting offenders and of course, with the benefit of hindsight, it is evident that for nearly all the political office holders in Nigeria the *raison d'être* for seeking political power is to have access to the commonwealth for personal aggrandizement.
15. She didn't partake in the Eucharist, so she is not in the state of grace.

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Unit 3 Arguments

Contents

1.0 Introduction

This study unit introduces the learner to the structure of arguments, the diagrammatic analysis of arguments and how to distinguish arguments from non–arguments. It deliberates with argument structure as the sum and substance of logic and with proposition or statement as the first element of the structure of an argument. It draws attention to ways of judging the presence of arguments and how useful diagrams could be

in analyzing arguments. Elaborating that both premise and conclusion of an argument must be *statements*, that is, claims that are either true or false, it distinguishes arguments from its look alike.

2.0 Intended Learning Outcomes

It is expected that at the end of this unit, you will be able to:

1. analyze the structure of every argument;
2. distinguish between statements and other types of expressions;
3. diagrammatically analyze the structure of arguments that details the relations between the various premises and conclusions
4. distinguish arguments from its look alike

3.0 Main Content

3.1 The Structure of an Argument

The chief concern of logic is the structure of an argument. Every argument in logic has a structure, and every argument can be described in terms of this structure.

From a logical point of view, the expression of strong feeling is termed emotive discourse, not argumentative discourse. So the definition of "argument" in this text, which indeed is a technical meaning of the term, is considerably narrower than its lexical definition indicates.

It has been highlighted that in logic, by "argument," we mean a demonstration or a proof of some statement, not emotional language; that is any group of statements of which one is claimed to follow logically from the others. *E.g.*, "That bird is a crow; therefore, it's black."

The argument structure is the sum and substance of logic. The first element of the structure of an argument is called proposition or statement (we will use these words interchangeably). In defining it, a ***Statement*** is a verbal expression that can be regarded as true or false (but not both). Hence, a statement or a proposition is a sentence with a truth-value. We can still regard a sentence as a statement even if the truth-value of the statement is not known.

It is notable that logic is just concerned with those statements that have truth-values.

Consider the confusion that would result if we considered the following sentences as statements:

1. "Good morning." (What's so good about it?)
2. "You are looking good today." (Well, I just saw my doctor and ...)
3. "What is so rare as a day in June? Then, if ever, come perfect days..." (Well, I don't know about that.)

4. To a waiter: "I'd like a cup of coffee." (Yeah, but I think Bigger; I'd like a BMW.)

Thus, phatic communication, greetings, commands, requests, and poetry, among other uses of language, are not meant to be taken as statements

Consider also, whether there are two statements in the following expressions:

An ex-military man is President (of Nigeria.).

An ex-military man is President (of Nigeria.).

Aside from the ambiguity of when the statements are uttered, of which President is being spoken, and so on, we would say that there is one statement and two sentences in the expressions. Sometimes logicians are thus wont to make a distinction between a sentence token (the ink, chalk marks, or pixels) and a sentence type (the meaning of the marks). It is also important to note that every statement comes with an implicit time, place, and

reference and of course the distinction between a sentence and a statement assumes that adequate synonymy of expression and translation between languages is possible.

We also must remark that one statement can be expressed by two different sentences.

For example, the sentence:

"This logic class is half-empty"

expresses the same statement as

"This logic class is half- full".

Further, a sentence can express different statements at different times. For example, the sentence "A military junta is President of Nigeria" as expressed in 1995 and 2008 is two *different* statements.

A sentence can also express an argument composed of several statements. For example, the sentence

"The graphical method of solving a system of equations is an approximation, since reading the point of intersection depends on the accuracy with which the lines are drawn and on the ability to interpret the coordinates of the point"

can be interpreted as two or three different statements depending on how we wish to analyze it.

It is remarkable that both premise and conclusion of an argument must be *statements*, that is, claims that are either true or false (whether or not we know which). *Questions*, in particular, cannot be premises or conclusions. In the sense of "argument" and "arguing" (offering an argument) we are using here we would not say "John was arguing whether God exists" – or at least if we did say this we would not be identifying the conclusion of his argument. "Who caused the world?" is not going to be a premise or conclusion of any argument, because it is not a statement. Nor is a question of the form

"Who is to say that ...?" Premises are claims that support the conclusion. Questions may be used to *suggest* claims, of course. Indeed this is so often done for effect in debate that such questions are known as "rhetorical questions." Thus a debater might say "Would you want to be governed by the military? Well, then you should support a strong defense." But insofar as there is an argument here, the premise is not the *question* “would you want to be governed by the military?” but the *answer* that the debater is presuming you would offer (silently) in reply to the question, namely that you would not want to be governed by the military.

Some of the indicator words given in Unit 2 may be present in some statements even though no argument is taking place. Some of these words, it is trite knowledge, have more than one meaning and do not always identify conclusions and premises. "It is raining because a storm is passing through" is not an argument even though the indicator word "because" is contained within the sentence.

It can sometimes be difficult, however, to determine whether some passage in written or spoken material is a genuine argument. Some written or spoken material may offer explanations which look like arguments, but are not genuine arguments. There may even be "reasons" given to explain something.

The best way to deal with these is to ask yourself what the primary intention of the writer or speaker is. If the intention is simply to explain, it is probably not an argument. But if something is being asserted (a conclusion) and reasons are given to justify the assertion, then it is an argument.

Many times people fall into the trap of arguing over what are called *value-claims*. Value-claims must be distinguished from fact-claims. A conclusion that is a value-claim may appear like an ordinary conclusion in an ordinary argument, but it is not. A conclusion in a genuine argument is always a fact-claim. What is the difference between a value-claim and a fact-claim?

A value-claim never has the element of objective truth in it because it does not deal with a fact. It is a matter of taste, not of objective truth. For instance, if I prefer Heineken beer and you prefer extra smooth stout, we are expressing matters of taste. It is useless to attempt to argue about our preferences regarding beer brand. In fact, no real argument is possible.

A *fact-claim* has the element of objective truth or, as may be the case, it can be shown to be false. A fact-claim can be argued about. There is a way to determine whether a fact-claim is true or false, although sometimes we may not be entirely able to do so at a given point in time. Ethical or moral claims present a special problem. And we probably spend a great deal of our time "arguing" over moral issues. The status of ethical "arguments" is controversial. Some authorities have argued that ethical and moral claims

are merely a matter of "taste," "personal preferences," or "feelings." Others have argued that at least some moral claims can be expressed as fact-claims

This calls for the distinction in logic between claims that are thought to be verifiable, and those that are presented as evaluative. In this sense, *verifiable claims* are those that can be confirmed either by observation or by reference to established sources, such as books. *Evaluations* are statements of taste and interpretation. Notice that opinions can be expressed sometimes as statements of verification and sometimes as statements of evaluation. Consider the following claims:

- "Kalu thinks that's a shade of blue."
- "Kalu thinks that's a lovely shade of blue."
- "That's a shade of blue."
- "That a lovely shade of blue."

The first two are clearly opinions, but they are expressed as statements of verification, because the issue is whether that is what Kalu thinks, not what the color is. The third one is a statement of *verification*, because (for most people) "blue" is something ascertainable by observation. But the fourth claim is a statement of evaluation, because what is "lovely" is a matter of taste. And it doesn't matter whether the claim is true or false – that is, a *false* statement of verification is not a statement of evaluation. All four of our examples can be false – Kalu might think otherwise, for the first two, and the color might be red, for the second two – but they are nevertheless three statements of verification, followed by a statement of evaluation.

Advocatory claims are a little different from verifiable or evaluative claims, in that the latter discusses what was, is, or will be, while the former describes what ought to have been or ought to be. Thus, "Adamu is a free man" is a claim of verification, "Adamu is a good man" is a claim of evaluation, and "Adamu ought to be a free man" and "Adamu should be a good man" are both advocatory statements. Advocatory claims usually include the word "should" or "ought" (though not all claims with "should" or "ought" in them are advocatory). The advocatory form is used for statements about morality, ethics, duty, and so on.

The point of categorizing statements into *verifiable, evaluative,* and *advocatory* is to understand better the arguments in which they appear. Knowing if a statement is one of verification, evaluation, or advocacy helps ensure a consistency of argument, because if the conclusion is a statement of verification, it must be supported by at least one premise that *is* a verifiable claim; and so too with conclusions of evaluation and advocacy

3.2 Diagrammatic Analysis of the Structure of Arguments.

Arguments in logic are composed of reasons being offered for a conclusion. The presence of an argument in a passage is discovered by understanding the author's intention of proving a statement by offering reasons or evidence. Generally speaking, these reasons are presented as verbal reports although they might not be initially presented in declarative sentences.

There are three main ways of judging the presence of an argument. First, the author or writer explicitly states the reasons, evidence, justification, rationale, or proof of a statement.

Example:

(a) *I conclude* that there was massive electoral fraud during the 2015 general elections. *These are my reasons*: (b) there are confirmed reports by journalists that electoral materials never got to most of the polling centers, yet results were announced for such centers, (c) independent and foreign observers have documentary evidence of situations where results there were officially declared are at variance with the results obtained at the polling venues, (d) there are video clips of under-aged children who voted in some states, and (e) the nullification of several results by different Electoral tribunals across the country for corrupt electoral practices.

Second, the author uses argument indicators signifying the presence of argument (see Unit 2 for a list of common premise and conclusion indicators).

Example:

(a) *Since* the solution turned red when the indicator was added, (b) I *conclude* it is acidic, (c) *in-as-much as* acidic substances react with this indicator to form a red color.

Third, the passage under question implicitly provides an answer to the sometimes irreverent question of "What are you trying to prove?". The presence of an argument cannot always be known with certainty or sureness. A charitable conventional interpretation of the content and context of the passage is assumed.

Example:

(a) The types of sentences you use are quite varied.

(b) I've noticed that your essays are quite sophisticated.

(c) You have been learning much more about sentence structure.

The conclusion is statement (c).

Notwithstanding these three rubrics, it is often difficult to determine just what the argument is. This is where it is obviously useful to construct a diagram of the structure of the argument. The activity helps us to reconstruct an argument such that the details of the relations among the various premises and conclusions is clearly exhibited. In order to analyze simple and complex arguments it is instructive to note the following:

(a) a conclusion of one argument can become a premise for another argument. Thus, a statement can be the conclusion of one argument and a premise for another argument just as a daughter in one family can become a mother in another family,

(b) the number of arguments in a passage is conventionally established by the number of conclusions in that passage, and

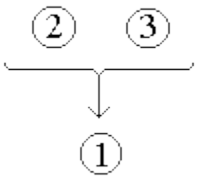
(c) in analyzing the structure of an argument, whether simple or complex, *the all–important first step is to find the conclusion.*

Some specific suggestions as to how to find the conclusion of an argument are:

1. The conclusion might be evident from the content and context of the paragraph structure. The sequence of sentences is often an indication of the conclusion. Arrangement of sentences from most "general" to "specific" is a common form of paragraph or passage; the arrangement of sentences from "specific" to "general" is a bit less common. Considering both cases, the conclusion is often the first and sometimes the last sentence in a passage. (Specificity and generality are not always easily discerned.)

Example:

(1) Ngozi didn't get enough sleep last night. (2) She yawns intermittently. (3) Her eyes are heavy.

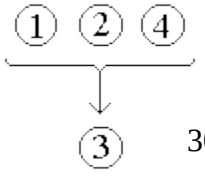


The conclusion is the first sentence in the passage.

2. Nevertheless, the conclusion can occur anywhere in the paragraph, especially if the passage has not been revised for clarity. Usually, if a conclusion is not the first or last sentence, a conclusion indicator is present, or the last sentence is presented as an after-thought with a premise indicator. See Unit 2 for lists of premise and conclusion indicators.

Example:

(1) Analysis of the technical report on the last general elections indicate that electoral violence is at the very root of low voters turnout, and (2) it has also been established that imposition of candidates by political parties leads to boycott of elections by the electorate. (3) *Hence*, I conclude that voters' apathy is caused by electoral fraud (4) because electoral violence and imposition of candidates are indices of electoral fraud.



3. The structure of the argument (and, of course, the conclusion, as well) might be inferred by: (a) ***Premise indicators***, (b) ***Conclusion indicators***, and *(c)* ***Conjunctives*** (including conjunctive adverbs)

Meaning and examples of premiss and conclusion indicators have already have given. For conjunctives, these are words that often indicate equal status for clauses or sentences. Noticing these conjuncts is especially helpful for argument analysis if one of the elements has already been identified. Indicators of clauses of equal status include: and, but, yet, however, moreover, in addition, nevertheless, (and also the semicolon";")

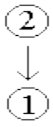
Examples of the use of these indicators in arguments can be illustrated as follows:

Example 1

(1) The orchestrated war against corruption by the Obasanjo administration is a colossal failure, (2) *because* the revelations arising from the sale of NITEL and the refineries clearly show that Mr. President himself was wantonly corrupt; he only used the Economic and Financial Crime Commission (EFCC) to harass and intimidate his perceived political enemies.

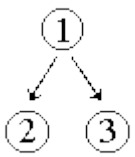
Example 2

(1) Protective sex is not a foolproof practice in the prevention of HIV/AIDS as is widely canvassed, (2) *after all*, the Action Against AIDS Programme found that over 35 percent of commercial sex-workers who were diagnosed and found to be infected by the virus had indeed religiously avoided unprotected sex; it is also reported that over 47 percent of victims of HIV/AIDS are psychedelic undergraduate female students who knew about and completely avoided unprotected sex in their escapades.



Example 3

(1) Some students absent today are unprepared for this quiz, since (2) the law of averages dictates that only 10% of students are absent due to illness, *and* (3) more than 10% are absent.



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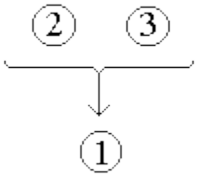
Example 4

(1) Lenses function by refracting light at their surfaces. (2) Consequently, *not only* does their action depends on the shape of the lens surfaces *but also* (3) it depends on the indices of refraction of the lens of the lens material and the surrounding medium.



When working with complex arguments, it is often helpful to reconstruct the argument backwards from the conclusion. Consider the following argument.

(1) If the students were really politically conscious, they would object to the optional clause of membership of their Union. (2) The age-long solidarity characteristic of students unionism has become endangered (3) as it has disappeared in the Labour Union (4) because the present policy of government is against the aspirations of the down-trodden. (5) Students did not object to the optional clause. (6) Thus, the students are not really politically conscious.

The premise indicators suggest that (2) is a sub conclusion of (3) since the indicator "as" connects them, and (3), in turn, is a sub-conclusion of (4) since the indicator “because” connects those two statements.

Statement (6) is the final conclusion since it has the conclusion indicator "thus" and the import of the paragraph indicates that this statement is the main point of the argument.

Intuitively, the structure of the first statement (1) together with statement (5) is a common argument form:

(1) If the students were really politically conscious, they would object to the optional clause of membership of their Union. (5) Students did ***not*** object to the optional clause. (6) Thus, the students are not really politically conscious, which can be abbreviated as follows:

If C then **O**

Not **O**

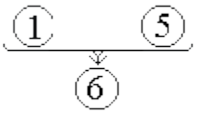
and the negation of clause **O** is logically equivalent to conclusion (6).

(this argument structure is termed *modus tollens)*:

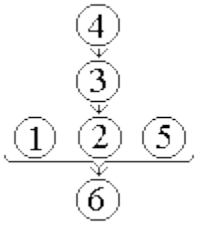
If **C** then **O**

Not **O**

Not **A** which is the same statement as (6).



Hence the whole argument can now be pieced together as:



The usefulness of diagramming arguments stand out clear in our diagrams above: 1. the claims or statements are identified and numbered, 2. claims are put into boxes, 3. the inferential connections are represented by arrows, and 4. all the excess rhetorical verbiage is removed.

Prima facie, argument diagramming may appear to be simple, but it is undoubted that quite a bit goes into it. So we need to learn some rules that will help us with the following skills that are needed for diagramming. 1. Identifying the premises and the conclusion 2. Eliminating non-essential verbiage (where appropriate) 3. Putting the steps of the argument in the proper order 4. Identifying the structure of the argument.

When diagramming arguments, one way to eliminate excess verbiage, after we have identified the premises and the conclusion, is to rewrite each statement as a complete, independent sentence that can be understood by itself. Thus the argument:

"Muhammadu Buhari should resign from office as President because of he has failed to stem the growing insecurity and violence in the Nigerian polity"

should be rewritten as:

premise: "Muhammadu Buhari has failed to stem the growing insecurity and violence in the Nigerian polity"

Conclusion: "Muhammadu Buhari should resign from office as President"

Two things stand out here. First, we did not write the premise as "he has failed to stem the growing insecurity and violence in the Nigerian polity" even though this is what

was written. This would not have been an independent sentence, because we need the other sentence to know who "he" is referring to.

Second, the word "because" does not appear in the rewritten argument because it is not a part of either statement. The author used it both as a connection between two statements, and as a premise indicator, but now that we have identified the premise, and rewritten the argument, the word itself is no longer needed.

There are some phrases, however, that may seem like connecting words, but are actually integral parts of a single statement. This happens often when we encounter conditional statements and when we encounter disjunctions.

Disjunctions are "or" statements, and when they occur, the entire statement as it is written is usually critical for the argument. Consider: Example:

Either you study hard for the exam, or you will repeat the class. You did not study hard for the exam, therefore, you will repeat the class. This argument is rewritten as:

Premises: Either you study hard for the exam, or you will repeat the class. You did not study hard for the exam.

Conclusion: You will repeat the class.

Conditional statements and disjunctions should not be broken down into their constituent parts when rewriting the statements of an argument. Common conditional-creating and disjunction-creating phrases are:

if…then	assuming that	either…or
only if	given that	neither…nor

4.0 Conclusion

Arguments in logic are composed of premises being offered as reasons in support of a conclusion. Any statement or expression that does not support its claim by providing reasons or justification for it cannot be classified as argument.

5.0 Summary

The structure of every argument is made up of statements, some which (called premise(s) give evidence or reasons for, accepting another statement (called conclusion or main claim) which is claimed to be established or affirmed on the basis of other statements (the premises).

Diagrams helps us to construct an argument such that the structure of the argument will clearly exhibit the details of the relations among the various premises and conclusions.

5.0 Tutor Marked Assignment

With relevant examples;

1. show how you can eliminate verbiage after identifying in an argument the premise(s) and conclusion
2. Differentiate between value-claim and fact claim

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Unit 4 Distinguishing Non-Arguments from Arguments

Contents

2.0 Introduction

This study unit introduces the learner to further characterization of argument. It aims at equipping them with how to sort out arguments from the rest of the kinds of linguistic behavior. Thus, the unit will expose learners to how to distinguish arguments from non–arguments. It elaborates that both premise and conclusion of an argument must be *statements*, that is, claims that are either true or false, it distinguishes arguments from its look alike.

2.0 Intended Learning Outcomes

It is expected that at the end of this unit, you will be able to:

1. distinguish between statements and other types of expressions;
2. diagrammatically analyze the structure of arguments that details the relations between the various premises and conclusions
3. distinguish arguments from its look alike

3.0 Main Content

We had noted that every argument in logic has a structure – every argument in logic can be described in terms of this structure:

(a) ***Premises***: statements which give evidence for, or reasons for, accepting the conclusion.

(b) ***Conclusion***: statement which is purported to be established or affirmed on the basis of other statements (the premises).

An argument has thus been defined as a set of statements containing a conclusion and one or more premises used to support that conclusion. The conclusion is a claim made by one of the parties in an argument for which that person provides evidence justifying the claim. The claim is supported by "reasons" and, therefore, the whole process is an act of reasoning.

If there is no conclusion supported by reasons, there is no argument. An announcement is not an argument. A command is not an argument. An apology is not an argument. A list of questions is not an argument. For an argument to be present there must be some claim, expressed as a conclusion, supported by evidence or reasons, expressed as premises. Anything else is a non-argument.

This characterization no doubt equips us to sort out arguments from the rest of the kinds of linguistic behavior. Indeed, in order to know to what we can apply our logic methods, we need to learn how to separate argumentative discourse from non-argumentative discourse.

Arguments are thus separated off from other uses of language, such as to explain something, give an example, or tell a story. In these cases, one might find a connected series of statements, but the author or speaker does not intend it to be the case that some of them provide support or evidence in favor of one of the others. So they are not arguments. Consequently, one must distinguish arguments from *reports of arguments*. If a newspaper journalist includes in his article a description of an argument given by a Senator in favor of the tenure elongation project of Obasanjo, the reporter is not arguing in favor of the tenure elongation or anything else. He is merely making a report. There are other uses of language that may appear at first blush to be arguments, but are not.

The point on prominent relief is that it's not always easy to spot arguments, and sometimes it's not always clear whether or not we have arguments. This is illustrated with an example, taken from Bobby McFerrin's song "Don't Worry, Be Happy":

Listen to what I say. In your life, expect some trouble. When you worry, you make it double. Don't worry. Be happy.

The question is: does this passage from the song contain an argument? If it did, we would have a conclusion, maybe something like:

"You shouldn't worry".

Or maybe:

"You should be happy".

Notice that "don't worry, be happy" is not a statement, so we need to rephrase it as a proper statement, i.e., as something that is either true or false.

However, it's not clear that this passage in the song really is trying to establish a point, though there's this other part:

When you worry, your face will frown, and that will bring everybody down. So don't worry. Be happy. Don't worry. Be happy now.

Maybe there's an argument here. An indication that we may be facing an argument is the indicator word *so,* a conclusion indicator. And it seems formulated as reasons that you shouldn't worry and that you should be happy. So maybe there's an argument:

If you worry, then your face frowns. If your face frowns, that brings everybody down. So if you're worried, that brings everybody down. So you shouldn't worry, and you should be happy.

The lesson to learn from this is that it is not always easy to identify arguments. Sometimes it looks as though some information is presented as an argument when it is not. Sometimes when people try to express themselves, they are trying to convince you of something, but they may not succeed in presenting their view as an argument. They may express their views without providing reasons for believing their views. It is thus necessary to discuss some notorious Non-arguments that look like arguments.

3.2 Typical argumentative "look-a-likes"

These fall into the following main categories, namely: *Emotional discourse, Simple non-inferential devices, Commands, Conditional statements* and *Explanations.*

3.2.1 Emotional discourse like **beliefs** and **opinions** are also often presented as if they were an argument.

There is a thin line between opinion and belief. We might be saying how we feel about some person or state of affairs. We could call this "stating an **opinion**." And we talk about what we believe to be the case with respect to a given situation, we generally call it "**belief**". But strictly speaking they are both expressions of a claim, made without supporting evidence. The difference (that one seems to express a personal feeling, while the other expresses what someone thinks is true) is less important, from the point of view of logic, than is the fact that if you add another statement, and a conclusion or premise indicating word, you'll get an argument from them both.)

The difference between an argument and opinion or belief is that an argument involves arriving at a judgment which is based on an evaluation of relevant ideas and evidence, while opinions and beliefs are views formed without sufficient evidence to support them. Opinions and beliefs generally reflect an individual's instinctive reactions and personal experience. They can be formed by or based upon virtually anything, and they are not necessarily based upon what is true, accurate or informed. This is in stark contrast to an argument. The most important distinction is that an argument is a coherent, logical set of reasons that support an overall judgment or assessment. How convincing an argument is, is dependent on how closely the various components of the argument support the overall position being presented. A good or convincing argument might, for example, present evidence clearly and coherently to help illustrate the point being made.

If we take an example of an emotional statement like:

"I think that abortion is a horrendous procedure. It violently kills a young, innocent human life and the extent of abortions in this country constitutes a new holocaust".

we notice that there is really no argument here — what we have are **emotive** statements (*value-claims*) rather than **cognitive** statements (*fact-claims*). No effort is made to establish the truth of what is said nor are they being used to establish the truth of something else. They are expressions of personal feelings. There is nothing wrong with emotive statements, of course — the point is that we must understand when we are looking at emotive statements and that they are not genuine arguments.

Of course, it will be common to find arguments which have **both** emotive and cognitive statements. Often, the statements above might be combined with other statements which would constitute an actual argument, explaining why abortion is wrong or why it should be illegal. It is important to recognize this and learn how to disengage the emotional and value claims from the logical structure of an argument.

3.2.2 Simple non-inferential devices. Similar to opinions and beliefs are such all very commonplace everyday things we do with words like, warnings, advice, reports, and instructions, that sometimes appear as arguments yet lack the claim that anything is being proved. They are categorized as simple non-inferential devices because statements involved in them may be premisses, conclusions or both, but the statements do not serve to infer a conclusion or support one another.

Warnings and advice are more or less the same. Often what we do is something like telling others what they ought to do (or what they ought not to do!) or how they ought to do it. On the positive side, this would be **advice**; viewed a little more negatively, you might call it a "**warning**." If, for example, a doctor recommends that a patient refrains from smoking, it could be seen as a pieces of advice or as a warning.

Nevertheless, whether taken as a pieces of advice or a warning, this is not an argument, even when expressed as a collection of statements.

Supposing Dr. Ihuoma says:

"To avoid the disease of chronic bronchitis you should refrain from smoking".

With this advice Ihuoma isn't arguing that smoking is dangerous to our health. She is just giving us a way of avoiding the disease of chronic bronchitis. The advice, however, could be used as part of an argument, since it is a statement. The argument could have as a conclusion: "To avoid the disease of chronic bronchitis you should refrain from smoking" if the entire argument is expressed as follows:

Smoking is dangerous to your health because it makes the smoker prone to the disease of chronic bronchitis. Therefore, to avoid the disease of chronic bronchitis you should refrain from smoking.

But on its own, advice (or warning) is not an argument.

Reports are also simple non-inferential devices that lack claims, the statements only serve to convey knowledge. Take for example:

Even though more of the world is immunized than ever before, many old diseases have proven quote resilient in the face of changing population and environmental conditions, especially in the developing world. New diseases, such as AIDS, have taken their toll in both the North and the South (culled from Steven *L. Spiedel, World politics in a new era)*

The above is considered a report because it informs the reader without making any sort of claim, ethical or otherwise. However, the statements being made could be seen as a set of premises, and with the addition of a conclusion it would be considered an argument.

Instructions are not arguments either. Take, for example, the instructions to make a cake. You take flour, and then you put in an egg, and then you put in some milk, and you throw the thing in the oven, and eventually you get a cake. The instructions are not providing reasons for anything. Generally, instructions are not trying to make a point, they don't have conclusions, and therefore, are not arguments.

3.2.3 Commands

Commands, especially those put as imperative statements are not arguments; they are not statements because they have no truth value. (However, they can be subjected to a "logic of commands".)

The point is that we could evaluate a series of commands for logical consistency (as when we are told to do different things by the same authority), but commands, strictly speaking, are neither true nor false, so they are not normally part of arguments.

No doubt, if we look at the uses of language it is evident that imperatives can function as directive (*e.g.*, "Study hard"), expressive (*e.g.*, "I had wonderful outing last Sunday), or informative (*e.g.*, "Study chapters 1, 2, 3, 6, and 9 – 12 for the examination"). It is important also to point out that we sometimes have to look at the context, for although imperatives are used, the passage might be meant to be an argument. Consider the following quotation: "*Be careful who you pretend to be, for that you will surely become."*

In this quotation one can only tell whether (1) it is explaining how pretense can be harmful, (2) it is trying to prove it, or (3) it is warning us not to pretend, by looking at the context in which this sentence was used.

That commands are pseudo-arguments can be found in the following examples:

1. You must do your duty to God, your Creator.
2. We must stop the government from interfering with people's private property.
3. People must make sure that international corporations don't get too much power.

None of these are really arguments, either — in fact, they aren't even propositions. A proposition is something which can be either true or false, and an argument is something offered to establish the truth value of the proposition. But the statements above are not

like that. They are commands, and cannot be true or false — they can only be wise or unwise, justified or unjustified.

3.2.4 Conditional statements

One common pseudo-argument which you will probably encounter too often is the conditional statements (also called hypothetical proposition). Consider the following examples:

1. If the Bible is accurate, Jesus was either a lunatic, a liar, or the Son of God.
2. If you want to improve the economy, you have to lower taxes.
3. If we don't act quickly, the environment will be damaged beyond repair.

These all look like arguments and, because of that, it isn't uncommon for them to be offered as if they were arguments. But they aren't: they are simply conditional statements of the if-then type. The part following the "**if"** is called the ***antecedent*** and the part following the "**then"** is called the ***consequent***.

In none of the three cases above do we see the premisses which would supposedly support the conclusion. If you want to try to create a genuine argument when you see such claims, you have to focus on the antecedent of the conditional and ask why it should be accepted as true. You can also ask why there is any connection between the hypothetical in the antecedent and the proposition in the consequent.

To better understand the difference between an argument and a conditional statement, look at these two very similar statements:

1. If today is Tuesday, tomorrow will be Wednesday.
2. Because today is Tuesday, tomorrow will be Wednesday.

Both of these statements express similar ideas, but the second is an argument while the first is not. In the first, we have an if-then conditional (as you can see, sometimes the then is dropped). The author is not asking readers to make any inferences from any premisses because it is not being claimed that today is, in fact, Tuesday.

But statement no.2 **is** an argument because "today is Tuesday" **is** being offered as a factual premiss. From this claim, it is being inferred — and we are asked to accept this inference — that tomorrow is therefore Wednesday.

Conditional statements (by themselves) are not arguments.: "If ... then ..." statements, sometimes called "hypotheticals," although look very much like arguments and intuitively "feel" very much like arguments, but their antecedents are not asserted to be true. They are no more than complex statements. Often, we will analyze an argument with conditional statements--*e.g.*, as in the statement, "If the premises are true, then the conclusions will follow" into parts: *If* (***antecedent)*** then ***(consequent)***

If I say, "If it rains class, then I will boycott lectures," I haven't proved anything. A conditional can be thought of as conditionally being an argument if the antecedent is true, but this is not at all what is being asserted. However, in an argument the premises are asserted as true.

Since conditionals are statements, then, of course, they can be part of arguments: Consider, the **hypothetical syllogism**

If I withdraw from the programme, then I will lose my job
If I lose my job, then my landlord will eject me
Therefore, if I withdraw from the programme then my landlord will eject me.

Or an argument form called ***modus ponens***

If you study hard, then you make an *A* in logic
You study hard.
Therefore, you make an *A*.

3.2.5 Explanations.

Like arguments, explanations are typically presented as collections of statements. In explanations, however, statements are not presented as reasons to believe other statements; they are not presented as premisses. Statements in explanations are trying to make you understand something, not trying to convince you that you should believe it.

Thus, in general explanations are not arguments; the purpose of explanations is not to prove, but to explain. To distinguish **arguments** from **explanations** we need to ask the following questions; do a group of statements give evidence, grounds, or reasons for some other statement? Is the purported conclusion better known than the purported premisses? Is a causal connection asserted or implied? What is the author's purpose in offering the passage? What is the context of the passage?

These questions point to the difference between arguments and explanations, nevertheless, arguments and explanations do, on occasions, overlap.

Strictly speaking, however, the difference between arguments and explanations is unmistaken. We note in this respect that sometimes it is agreed by participants in a conversation that a certain event has taken place, or that a certain thing is true. Suppose, for example, it is agreed that Chinyere is late for her lecture today. Someone might explain this fact as follows:

Chinyere's car broke down yesterday, and without it she cannot attend lectures on time. Therefore, she is late for lecture today.

The above may appear to be an argument. In fact, it has the same structure as an argument, and even includes the indicator "therefore". However, notice that the person

speaking these words is not attempting to provide support or evidence for the truth of the claim that “Chinyere is late for her lecture today": that is already accepted as true in this context by everyone involved. Properly speaking, the above example is an *explanation*, not an argument. However, in another context, in which it was not generally known that Chinyere is late for lecture today, these very words *could* be used as an argument. Consequently, it is impossible to ascertain whether or not a certain utterance is an argument without ascertaining the speaker's intentions within the given context.

An explanation is not an argument. Whereas an argument is a series of statements designed to support or establish the truth of an idea, an explanation is a series of statements designed to shed light on some event that is already accepted as a matter of fact.

Technically, an explanation is composed of two parts: the *explanandum* and the *explanans*. The explanandum is the event or phenomenon or thing which is supposed to be explained. The explanans is the series of statements which is supposed to do the actual explaining.

Here is an example:

1. Smoke appears because of fire: a combination of flammable material, oxygen, and sufficient heat.

The phrase “smoke appears” is the explanandum and the phrase “fire: a combination of flammable material, oxygen, and sufficient heat” is the explanans. In fact, this explanans itself consists of an entire explanation — “fire” plus the reason why fires happen.

This is not an argument because no one disputes the idea that “smoke appears.” We already agree that smoke exists and are simply looking to find out **why**. Were someone to dispute the existence of smoke, we would have to create an argument to establish the truth of smoke.

Although none of this seems very enlightening, the fact of the matter is that many people don’t entirely realize what goes into a good explanation. Compare the above example with this:

2. Smoke appears because of smoke-producing events.

This is not a valid explanation, but why? Because it provides us with no **new** information. We have not **learned** anything from it because the supposed explanans is simply a restatement of the explanandum: the appearance of smoke. A good explanation is something which provides new information in the explandum which does not appear in the explanans. A good explanation is something from which we can **learn**.

In the first example above, we are provided with new information: fire, and what causes fire. Because of that, we learned something new which we did not know from simply examining the explanandum.

Unfortunately, too many "explanations" we see take a form more like no.2 than like no.1. It usually isn't quite so obvious as these examples here, but if you examine them closely you will find that the explanans is little more than a restatement of the explanandum, with no new information added.

Contrast the following two statements:

1. I am a Fulani, so I voted for the Fulani Presidential candidate.
2. She didn't vote in the General Elections, so she must be a Jehovah Witness adherent.

In the first statement, no argument is being offered. It is an explanation of an already-accepted truth that the speaker voted for the Fulani Presidential candidate. Statement no.2, however, is a bit different — here, we are being asked to infer something ("she must be a Jehovah witness adherent") from a premise ("She didn't vote in the general elections"). Thus, it is an argument.

The difference between an argument and an explanation can be summarized as follows:

Argument	**Explanation**
(1) expresses an inference	does not usually express an inference
(2) offers evidence, grounds or reasons	offers an account why
(3) goes from well-known statements to statements less well known	gives less well known statements why a better known statement is true
(4) draws a logical connection between statements	describes a causal connection
(5) has the purpose to establish the truth of a statement	has the purpose to give an account of something

4.0 Conclusion

Arguments in logic are composed of premises being offered as reasons in support of a conclusion. Any statement or expression that does not support its claim by providing reasons or justification for it cannot be classified as argument.

5.0 Summary

Notwithstanding, some statements or expressions are presented as an argument when in fact, they are. This is because such statements or expressions fail to present to provide for their claims; for an argument to be present there must be some claim, expressed as a

conclusion, supported by evidence or reasons, expressed as premises. Any statement or expression that that thing else is a non-argument.

6.0 Tutor Marked Assignment

For each of the following expressions (1) identify those that are arguments and for those that are not arguments state what they are; (2) for those that are arguments, identify (a) the conclusion and the premise (s) (b) the premise(s) indicator and the conclusion indicator.

(1) God is a rational impossibility, *so* theologians and apologetics who try to prove God's existence end up with psychologically and emotionally persuasive arguments.

(2) Because Christians refused to acknowledge the state religion, which was the cult of the emperor, and because they refused to participate in its rather perfunctory rites, they were regarded as politically subversive and were bitterly persecuted.

(3) Day could not be called the cause of night, because it would not be followed by night if the earth's rotation were to cease.

(4)Analysis of the technical report on the last general elections indicate that electoral violence is at the very root of low voters turnout, and it has also been established that imposition of candidates by political parties leads to boycott of elections by the electorate. Hence, I conclude that voters' apathy is caused by electoral fraud because electoral violence and imposition of candidates are indices of electoral fraud.

(5) I think that abortion is a horrendous procedure. It violently kills a young, innocent human life and the extent of abortion in this country constitutes a new holocaust.

(6)The orchestrated war against corruption by the Obasanjo administration is a colossal failure, because the revelations arising from the sale of NITEL and the refineries clearly show that Mr. President himself was wantonly corrupt; he only used the Economic and Financial Crime Commission (EFCC) to harass and intimidate his perceived political enemies.

(7)The Roman Empire crumbled to dust because it lacked the spirit of liberalism and free enterprise.

(8) If you want to know what God thinks of money, just look at the people he gave it to.

(9) Seeing things on a great scale, they [New Kingdom Egyptians] sought to create greatness, no longer after the manner of their ancestors, the Pyramid-builders, by the exaggerated bulk of their material, but by the reasoned immensity of their conceptions; thus architects had arrived at the gigantic colonnades of Luxor and Karnak

(10) Be careful what you pretend to be because you are what you pretend to be.

(11) The marching band on the football field is more of a show than a concert. In such situations, the listener's relationship to music is a passive one, he hears the music but

does not actually listen to it, and therefore, real appreciation does not exist in such conditions.

(12) Herbs which restore strength and tonify weakened tissues when the body is "empty"–deficient–are called "tonic." Clinically, tonics are used for two purposes. One is to increase the body's resistance to disease when resistance has been impaired by excess "evil-qi. The second clinical use is to restore energy and accelerate recovery in patients who have become weak and vulnerable due to long-standing chronic ailments. Tonics are among the most useful of all drugs in Chinese herbal medicine.

(13) The mill wished to employ girls, because girls never rebelled against the harder work, the stretching-out, the longer hours, or the cutting of pay.

(14) Today, because of its etymology and much of the actual work of specialists, philology is frequently understood to mean linguistics, especially historical grammar and the study of past forms of languages. Since the term has so many and divergent meanings, it is best to abandon it.

(15) Onyekachi has recharged his iPod battery many times because the battery on Onyekachi's iPod is worn out

(16) A good way to stop your dog from getting fleas is to spray them with cider vinegar.

(17) Strike action by the organized labour has been on the increase in Nigeria in the past few years. Three years ago, the Nigeria Labour Congress (NLC) embarked on an indefinite strike action in reaction to government's rather unpopular determination to deregulate the price(s) of petroleum products. Last year, the Academic Staff union of Universities (ASUU) and both PENGASEN and NUPENG went on strike to press for better conditions of service. Last three months, the Non-Academic Staff Union of Universities, the Nigerian Medical Association and the unions of both junior and senior workers in the banking industry were all on strike because of oppressive policies of the Federal Government.

(18) The fight against corruption in Nigeria has continued to fail because the respective Presidents have always been selective and partisan in prosecuting offenders and of course, with the benefit of hindsight, it is evident that for nearly all the political office holders in Nigeria the *raison d'être* for seeking political power is to have access to public funds for personal aggrandizement.

(19) She didn't partake in the Eucharist, so she is not in the state of grace.

(20)Research has shown that people who do at least 30 minutes a day of vigorous exercise reduce their risk of heart disease and some forms of cancer, it would thus be wise for you to begin a daily program of exercise.

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MODULE 2

Unit 1 Types of Arguments

Contents

1.0 Introduction

So far in this module, you have learned what arguments are and how to determine their structure, including how to distinguish arguments from its look-alike. But what makes an argument good or bad? This study unit, therefore, introduces you to the methods of reasoning and how to evaluate arguments, so that you can check your own arguments and evaluate the arguments of others. It teaches you to classify arguments into its major types: **deductive and inductive arguments.** It also teaches you the characteristics, strength and weakness of both deductive and inductive arguments

2.0 Intended Learning Outcomes

It is expected that at the end of this unit, you will be able to:

1. recognize poor arguments and be prepared to offer better reasons in your own arguments.
2. identify both deductive and inductive types of arguments in any passage find them.
3. distinguish between inductive and deductive inference.
4. evaluate arguments in various and different contexts.

3.0 Main Content

Nearly every undertaking in life will ultimately require that you evaluate an argument. Thus, the ability to evaluate arguments is an ability useful in everything that you will do – in your work, your personal life, and your deepest reflections. As a student, we will note that

nearly every discipline–be it a science, any of the humanities, or a study like business–relies upon arguments. Evaluating arguments is the most fundamental skill common to math, physics, psychology, history, literary studies, and any other intellectual endeavor. It is, therefore, essential that we pay special attention to how to evaluate arguments in this Study Unit

3. 1 Classification of Arguments into Types

Inferences are assessed in terms of the relationship that is held to exist between the premises and the conclusion of an argument. Since all arguments involve the claim that their premises provide reasons (or evidence) on the basis of which the conclusion is arrived at, that is, the premises provide some grounds for the truth of their conclusions, it is this relationship between the premises and conclusion that determines whether an argument is correct or not.

In evaluating arguments or making inferences two distinct procedures or methods have been identified. These reasoning procedures are ordinarily called the *deductive* and *inductive* procedures. It is, however, a notable fact that in discussing these procedures the locutions: deductive and inductive inferences and deductive and inductive arguments are often used interchangeably. Although this does not really do any harm, it is nevertheless important to remark that a basic distinction exists between an argument and an inference. An argument both generally and primarily involves the provision of reasons in support or against a viewpoint or position, while inference is the process that corresponds to this. In other words, whereas an argument is simply a group of propositions in which it is claimed that one or more propositions (called the conclusion) follow from the other propositions (called the premises); an inference is the transition from those group of propositions called the premises to the group of proposition(s) called the conclusion.

It is instructive to note that traditionally, “deduction” is defined as *reasoning from the general to specific* and "induction" as *reasoning from the specific to the general*. While this usage is still sometimes found even in Logic texts, it is misleading and erroneous. For example, according to the more modern definitions given below, the following argument, even though it reasons from the specific to general, is deductive, because the truth of the premises *guarantees* the truth of the conclusion:

The members of the Adamu’s family are Bello, Hassan and Aisha.
Aisha wears glasses.
Hassan wears glasses.
Bello wears glasses.
Therefore, all members of Adamu’s family wear glasses.

Moreover, the following argument, even though it reasons from the general to specific, is inductive:

It has rained in my village every 1st January in recorded history.
Therefore, it will rain in my village this coming 1st January.

The difference between *deductio, a leading down* and *inductio, a bringing in* does not lie in *reasoning from the general to specific* and *reasoning from the specific to the general*. In deduction, we begin with statements that function as principles and we argue from them. In induction, we begin with statements that do not function as principles but rather lead to them in conclusions.

3. 2. Deductive Argument

The inferential procedure or method of evaluating arguments called ***deductive inference*** is that in which the relationship between the premises and conclusion of an argument is such that the premises provide adequate or sufficient reason(s) for asserting the conclusion, that is, the information provided by the premises is such that once they are accepted it would be inconsistent or self –contradictory to deny the conclusion. In other words in evaluating a deductive argument the inference is such that the premises necessitate or logically imply the conclusion. The point here is that some proposition (the conclusion) follows with strict necessity from other propositions (the premises). This is what we mean by deduction; the noun "deduction" refers to the process of advancing a deductive argument, or going through a process of reasoning that can be reconstructed as a deductive argument, that is, the conclusion of an argument is *deduced* from its premises.

Because the premises of deductive arguments provide conclusive information/evidence for their conclusion, the truth of the conclusion of such arguments therefore necessarily follows from the truth of the premises; this is the exact meaning of the premises necessitating the conclusion. Little wonder, therefore, the claim that in deductive arguments inference does not go beyond the information provided in the premises, it simply make part of it explicit. The point is that the premises of deductive inference necessitate the conclusion precisely because the conclusion says nothing that is not at least, implied, if not actually stated, by the premises. This underscores why deductive arguments are said to be demonstrative and empty. The conclusions of deductive arguments do not give new knowledge or information; the truth of the conclusion is "contained within" the truth of the premises; i.e., the conclusion does not go beyond what the truth of the premises implicitly requires. For example, in

All sound academics are intellectually honest	*premise*
All philosophers are sound academic	*premise*
Therefore, philosophers are intellectually honest	*conclusion*

the conclusion, for certain, says nothing that is not already expressed in the premises.

In deductive arguments the conclusion follows from the premises because of the agreed *meaning* of the *syncategorematic* words used to express the argument. Syncategorematic words are connector words, such as 'if', 'or', 'not', and 'all', rather than content-bearing words. For example, in an argument of the form "All A are B and all B are C, so all A are C," the argument is valid primarily because of the concept of class inclusion expressed in the words "all...are..." Because deductive arguments turn upon the meaning of words, the conclusion of a valid deductive argument follows from the premises *by definition*. The premises, in effect, *stipulate* that the conclusion is true. It is for this reason as we have noted that deductive reasoning gives us no new information about the world; but this also makes deduction the most powerful type of reasoning. Given the truth of the premises, the conclusion *must* also be true.

Because *deduction* rhymes with *reduction*, you can easily remember that in deduction, you start with a set of possibilities and reduce it until a smaller subset remains. For example, a murder mystery is an exercise in deduction. Typically, the detective begins with a set of possible suspects — for example, the gateman, the maid, the business partner, and the widow. By the end of the story, he or she has reduced this set to only one person — for example, "The victim died in the bathtub but was moved to the bed. But, neither woman could have lifted the body, nor could the gateman with his war wound. Therefore, the business partner must have committed the crime."

It needs be remarked that logic allows you to reason deductively with confidence. In fact, it's tailor-made for shifting through a body of factual statements *(premises*), ruling out plausible but inaccurate statements (*invalid conclusions*), and getting to the truth (*valid conclusions*). For this reason, logic and deduction are intimately connected.

3.3 Inductive Argument

The second type of argument, called induction, involves the inferential process called ***inductive inference***; it is a reasoning process in which the relationship between the premises of an argument and its conclusion is such that the set(s) of information provided by the premises do not necessarily warrant the conclusion, that is, the premises does not give conclusive evidence or information for the establishment of the conclusion. This is not to say that the premises of an inductive argument do not provide some support for the conclusion, the point is that the support is not adequate; this is why it is said that the

premises do not entail the conclusion. In other words, inductive arguments are those whose premises do not necessitate, but only render probable their conclusion. Inductive reasoning as such does not provide conclusive evidence for the truth of a given conclusion. In such reasoning, we merely want the evidence to show that it is more probable than some other conclusions we might have reached. Because the premises of inductive argument provide only some support, for the establishment of the conclusion, it is therefore possible, in inductive inference for the premises of an argument to be true and the conclusion false. In this connection, inductive inferences deal with cases of probability and the theory of confirmation, but not with the rules of correct reasoning in the sense of conclusive or valid reasoning. Inductive logic as such is concerned with the soundness of those inferences for which the evidence is not conclusive; it deals with inferences, which are probable, given as evidence the truth of certain inferences upon which they are based. For example, in the two inferences below:

All members of the National Assembly from the South Eastern and South South geo-political States elected under the platform of the Peoples Democratic Party were not democratically chosen.

All members of the National Assembly from the South Western, North Central and North Eastern geo-political states elected on the platform of the People's Democratic Party (PDP) were not democratically chosen.

Therefore, all members of the National Assembly from the all geo-political Zones elected under the platform of the People's Democratic Party were not democratically chosen.

Most radical Student Union Leaders are Marxists

Red Drum is a radical Student Union leader

Therefore, Red Drum is a Marxist

the premises of the arguments only render the conclusions probable; they do not entail the conclusion. This explains why it is said, concerning inductive reasoning that the premises of the argument lead to what may be true, rather than what must be true. In effect, there is no logical necessity between the truth of the premises and the truth of the conclusions. The upshot is that one can accept the truth of the premises of the arguments and still deny the conclusion without any (formal) contradiction. This in a more general sense is what we mean by saying that an inductive argument does not involve the claim that its premises entail the conclusion; it only claims that the premises provide some evidence for the conclusion.

The point that sticks out here is that no matter the weight of evidence of an inductive premise(s), the conclusion of such an argument is only probable. Nevertheless, a distinction between strong and weak induction has been. A ***strong induction*** in this sense is an argument in which the truth of the premises would make the truth of the conclusion highly probable, but not definite. But when the link between the premises and the inductive conclusion is weak, a ***weak induction*** is said to apply. For example:

My teacher always award bonus marks.
My teacher has been assessed as a good teacher.
Therefore: All teachers who award bonus marks are good teachers.

Assuming the premises to be true, this example is built on the certainty that "because my teacher always award bonus marks and my teacher has been assessed as a good teacher" leading to the generalization that "All teachers who award bonus marks are good teachers.". However, the link between the premises and the inductive conclusion is weak. No reason exists to believe that just because my teacher awards bonus marks and he is assessed as a good teacher that there are no other ways for teachers who do not award bonus marks to be assessed as good teachers, or that other people cannot be assessed as good teachers unless they award bonus marks. Indeed, not all those assessed as good teachers award bonus marks; moreover, not all teachers who award bonus marks are assessed as good teachers. The conclusion cannot be strongly inductively made from the premises. Using other knowledge we can easily see that this example of induction would lead us to a clearly false conclusion. Conclusions drawn in this manner are usually overgeneralizations; the probability link is weak, in fact unwarranted.

Many ripe oranges are sweet.
Therefore: All ripe oranges are sweet.

In this example, the premise is built upon a certainty; however, it is not one that leads to the conclusion. Not every ripe orange is sweet. In other words, unlike "The sun rises every morning", there are plenty of examples of ripe oranges that not sweet. Therefore the conclusion drawn can easily be true or false, and the inductive logic does not give us a strong conclusion. In both of these examples of weak induction, the logical means of connecting the premises and conclusion (with the word "therefore") are faulty, and do not give us a strong inductively reasoned statement. If we take strong induction we have such an argument as:

All observed humans die.
Therefore: All humans are mortal.

This exemplifies the nature of induction: inducing the universal from the particular. However, the conclusion is not certain. Unless we can systematically falsify the possibility of humans not dying, the statement (conclusion) may actually be false. For example; one could examine to find whether it's possible to pinpoint humans who didn't die. In doing so, we could discover that there are records of humans who didn't die (such examples as Elijah, Enoch). Even if we change the definition of "human" to require mortality, the original question of the possibilities for immortality would stand, semantically only hidden.

A strong induction is thus an argument in which the truth of the premises would make the truth of the conclusion highly probable, yet not definite. An inductive argument is intended to provide only probable support for its conclusion, being considered strong if it succeeds in providing such support and weak if it does not.

The point is that, in inductive arguments whether weak or strong, the premises do not afford sufficient guarantee for its conclusions. This is why it is said that in inductive reasoning, the relationship between the premises and conclusion is not a matter of necessity but of probability; even if all the premises of an inductive argument are true, it would still not be sufficient to assert that the conclusion is true. This is what we mean when we said that the truth of the conclusion of an inductive argument whose premises are true could be denied without involving any contradiction.

This is further illustrated by the example below:

Nneoma prepares better than Nkechi, Chinwe and Amara for her semester examinations and has always performed better them
Nneoma has prepared better than Nkechi, Chinwe and Amara for the forth-coming semester examinations.
Therefore, Nneoma is sure to perform better than Nkechi, Chinwe and Amara in the forth-coming semester examinations.

The truth of the conclusion of this argument can be denied without any kind of contradiction. This is because the premises are not sufficient to warrant the conclusion. The best the premises of the above argument (as indeed in all inductive inferences) can do is make probable the conclusion. It is obvious that its truth (as indeed the premises of all inductive arguments) do not guarantee the truth of its conclusion; it merely supports it.

Accordingly, inductive arguments are said to be non-demonstrative – that is, the truth of the conclusion of such arguments does not follow necessarily from the truth of the premise(s). Inductive inferences are, therefore, said to be ampliative in the sense that the conclusion expands upon the content of the premises; that is the ampliative character of induction, by contrast, provides a way to extend our knowledge. This ampliative

character is a primary virtue of inductive arguments. However, for Ron Yezzi (1992), even the *concept* of ampliative argument is suspect, when we remind ourselves that it suggests getting something from nothing or, more precisely, that its conclusion claims more than its premises are.

Inductive arguments come in several forms, including *enumerative*, *analogical*, and *causal*. In ***enumerative induction***, we argue from premises about some members of a group to a generalization about the entire group. The entire group is called the target group; the observed members of the group, the sample; and the group characteristics we're interested in, the relevant property..." It licenses an inference from "Some As are B "to "All As are B. An enumerative induction can fail to be strong by having a sample that's too small or not representative. Opinion polls are enumerative inductive arguments, or the basis of enumerative inductive arguments, and must be judged by the same general criteria used to judge any other enumerative induction.

In ***analogical induction***, or argument by analogy, we reason that since two or more things are similar in several respects, they must be similar in some further respect. An (inductive) analogy thus proceeds from known similarities between two things to a conclusion about an additional attribute common to both things.

P is similar to Q.

P has attribute A.

Therefore: Q has attribute A.

An analogy relies on the inference that the properties known to be shared (the similarities) imply that A is also a shared property. The support which the premisses provide for the conclusion is dependent upon the relevance and number of the similarities between P and Q. We evaluate arguments by analogy according to several criteria:

(1) the number of relevant similarities between things being compared,

(2) the number of relevant dissimilarities,

(3) the number of instances (or cases) of similarities or dissimilarities, and

(4) the diversity among the cases.

A ***causal induction*** draws a conclusion about a causal connection based on the conditions of the occurrence of an effect. Premises about the correlation of two things can indicate a causal relationship between them, but additional factors must be confirmed to establish the exact form of the causal relationship. This is fully illustrated by the following example and discussion [culled from *Mission Critical (Introduction to Causal Arguments)]*

A bicyclist moves into the traffic lane in order to pass a truck illegally parked in the bike lane. The driver of a car approaching from the rear slams on her brakes

in order to avoid hitting the bicycle. A following car fails to stop in time, and smashes into the back of the first .The insurance companies disagree about who should be held responsible, and they go to court to decide who caused the accident.

What arguments are likely to be made in court? The bicyclist's lawyer will probably claim that the illegally parked truck *caused* her client to swerve into the lane of traffic. The lawyer for the driver of the first car will probably claim that the bicyclist's actions *caused* her client to slam on the brakes. The lawyer for the second driver will probably claim that the first car's sudden stop *caused* his client to smash into its back.

None of these claims seems to fit the pattern of an inductive argument, because none of them seems based on observation or experience. But, in fact, they do fit that pattern. The bicyclist's lawyer, for example, is actually arguing that:

1. Normally the bicyclist would have continued in the bike lane, but in this instance he swerved into the lane of traffic.
2. The only significant difference between "normally" and "in this case" is the presence of the illegally parked truck.
3. Therefore, the truck *caused* the bicyclist to swerve.

The lawyers for the drivers are making similar arguments: the first, that the only significant difference was the swerving bicycle; and the second, that the only significant difference was the suddenly braking car. Like inductive reasoning, then, these causal arguments are based on observed instances. (In this case, no observations are needed to convince us that the bicyclist would not normally have swerved or the first driver would not normally have braked suddenly. But if, for some reason, observations were necessary, we could design a study of automobile and bicycle traffic on that street, or survey drivers and bicyclists about their experiences or in other ways provide evidence to verify the part of the premise describing the normal pattern of traffic.

These causal arguments, then, follow the form of an inductive argument with one important exception: whereas an inductive argument carries as part of its second premise the implication that there is otherwise no significant difference, these causal arguments carry the implication that there is only one significant difference: for the bicyclist, the truck; for the first driver, the bicycle; for the second driver, the first car. The strength of a causal argument, then, relies on three factors:

1. **how acceptable or demonstrable the implied comparison is** (for example, do we think that there is a basic similarity in most respects between the circumstances

of this accident and those of the many other times bicycles and cars have traveled on this street safely;

2. **how likely the case for causation seems to be** (for example, do we think that a bicycle swerving into an car's lane can cause an accident?);
3. **how credible the "only significant difference" or "only significant commonality" claim is** (for example, do we believe that the illegally parked truck is the only significant difference between this case and the many other times bicycles and cars went down that street without an accident?).

Generally, in inductive arguments a conclusion is drawn about a class of objects, based upon the characteristics observed in a sample of that class. Such arguments are persuasive to the extent that the sample was connected *causally* to the larger class in such a way that the characteristics of the larger class will be reflected in the sample. For example, "Most of the jellybeans in my hand are red. They were taken from this jar, and I mixed them up well before I took them out. So most of the jellybeans in this jar are red." It is because inductive arguments turn upon the causal connection between a sample and a larger class that they allow us to draw conclusions that extend beyond what is said in the premises. Induction thus indicates facts about the world beyond what we actually observe; but this also makes induction open to the possibility of error. Given the truth of the premises, the conclusion *is probably* true, but even true premises cannot *guarantee* a true conclusion.

In sum, *induction* begins with the same two letters as the word *increase,* which can help you remember that in induction, you start with a limited number of observations and *increase* that number by generalizing.

For example, suppose you spend the weekend in a small town and the first five people you meet are friendly, so you inductively conclude the following: "Everybody here is so nice." In other words, you started with a small set of examples and you increased it to include a larger set.

On the other hand, as apparently useful as induction is, it's logically flawed. Meeting five friendly people — or 10 or 10,000 — is no guarantee that the next one you meet won't be nasty. Meeting 10,000 people doesn't even guarantee that most people in the town are friendly — you may have just met all the nice ones.

Logic, however, is more than just a good strong hunch that a conclusion is correct. The definition of logical validity demands that if your premises are true, the conclusion is also true. Because induction falls short of this standard, it's considered the great white

elephant of both science and philosophy: It looks like it may work, but in the end it just takes up a lot of space in the living room.

4.0 Conclusion

Arguments are classified in terms of the relationship that exists between the premises and the conclusion of the argument. If the premises of an argument *definitely establishes* or *necessitates* the truth of its conclusion, then the argument is *deductive*; but if the premises provide only good reasons that render the conclusion probable, then the argument is *inductive*. Thus, it is this relationship between the premises and conclusion that determines whether an argument is deductive or inductive.

5.0 Summary

There are two distinct procedures or methods of evaluating arguments or making inferences. These reasoning procedures are the *deductive* and *inductive* procedures. The difference between deductive and inductive arguments does not lie in the words used within the arguments, but rather in the relationship of necessity and probability between the premises and the conclusion. Whereas deductive arguments deal with the relationship of necessity between the premises and conclusion, inductive arguments deal with the relationship of probability (based on strength of evidence) between them.

6.0 Tutor Marked Assignment

Examine the following arguments and determine those, which are Deductive, and those, which are Inductive

1. Only those African professional footballers who are regular features in European clubs sides provided that such club sides are in the premier division are sure to don their country's colours in the next edition of the African Cup of Nations finals. Amokachi who plays in one the topmost club sides in Europe has been on the bench for the greater part of the season because of injury. Nevertheless, the Nigerian press is seriously canvassing for his inclusion in the team list that will play in the next edition of the African Cup of Nations. Therefore, Amokachi is sure to play for Nigeria in the next edition of the Nations cup.
2. The character of Okoronkwo was impeached by the entire community; he is a known robber and has been involved in almost all robberies in the community and its environs in the last two years. Last week there was a robbery attack on the highway, just 2 kilometers to Mr. Okoronkwo's town. Therefore, Mr. Okoronkwo is certain to be a member of the gang that launched the robbery attack.
3. If you study hard and work conscientiously, you are sure to pass the forth-coming semester examinations provided your lecture attendances meet the required

minimum for eligibility to participate in the examination. However, if you cheat in the examination, no matter what effort you had made, you are certain to fail. Therefore, to secure a pass in the forth-coming semester examinations, in addition to all other efforts you must not cheat.

4. All matriculation and convocation ceremonies in the University of Port-Harcourt had held at the pavilion. Since the new Vice-Chancellor did not allow the use of the pavilion for the last matriculation ceremony. Therefore, it is certain that he will also not allow its use for the forth-coming convocation ceremony.
5. All freshers in the University are to take a minimum of four General studies Courses. Beredugo is a first year student. Therefore, Beredugo is certain to take at least four General studies courses.
6. Nneoma took either a night Buscar or the first morning flight. If she took a night Buscar or travelled with her Uncle from Benin, she would have been exhausted and her performance would be affected. She was not exhausted. Therefore, she took the first morning flight.
7. Government has become more unpopular since the first increment of the pump price of fuel. Given the importance of fuel to the Nigerian populace and the concomitant hardship arising from the increment, the government will lose the next general elections.
8. All acclaimed beautiful girls are arrogant
   All arrogant girls are hard to get along with
   Girls who are hard to get along with do not make good wives
   Therefore, all acclaimed beautiful girls do not make good wives.
9. The art of breaking promises without batting an eye is characteristic of most politicians, and you know that Aremu and Matthew are politicians; you therefore should not take their promises serious for they can easily break them without any scruples.
10. All professional footballers are technically good and successful.
    All research-oriented academics are technically good and successful
    All hardworking students are technically good and successful.
    Therefore, all those who are technically good are successful.
11. Given the view that species evolve into one another, then members of one species must somehow give rise to members of another species. It follows that members of the second species must somehow derive as variants of members of the first.
12. Buttermilk is partially fermented skimmed milk that has become viscous because Leuconostoc, a filamentous relative of the lactobacillus, has grown in it.

1 3. There is a common substance among the arts because there are general conditions without which an experience is not possible.

14. Chick embryos inoculated with human fibro sarcoma cells derived from a type of bone cancer were dosed for nine days with an amount of alcohol corresponding to about two glasses of wine a day in people. Those embryos developed an extensive network of blood vessels and doubled in size. The cancer in the alcohol-dosed embryos secreted a protein called vascular endothelial growth factor. These data suggest that alcohol is an important mechanism for cancer growth.

15. When plants landscaped with crushed rock are watered, evaporation of soil moisture sometimes creates colorful crusts of salts on the surface of the ground. The minerals in these crusts contain concentrations of zinc, molybdenum, and copper, and the concentrations of these elements are sometimes deemed unsafe. Consequently, undesirable trace elements are getting into the environment.

16. In investigating hereditary characteristics, we find that vast amounts of literature in the last few years point toward two types of fiber in human muscle tissue: Type 1, slow twitch, or red; and Type 2, fast twitch or white muscle fiber. It is believed that the number of white and red muscle fibers is genetically predetermined and remains unchanged during a lifetime. Consequently, in accordance with the distribution that prevails, some people appear to be quicker than others.

17. All human beings have the ability to think rationally and realistically. We all can realize, “Even if I am probably correct, there is still room for questioning.” Thus we can allow discussion, disconfirmation, and new evidence to change our minds

18. Most psycho historians reject non-psychoanalytic psychologies for use in historical research because of their ahistorical non-developmental character and because they are either so simplistic that they explain only elementary traits or so lacking in structural coherence as to be unusable by historians.

19. It is not recorded what part either Themistocles or Aristides took in the debate of the council of war at Marathon. But from the character of Themistocles, his boldness, and his intuitive genius for extemporizing the best measure in every emergency (a quality which the greatest of historians ascribe to him beyond all his contemporaries), we may well believe that the vote of Themistocles was for prompt and decisive action.

20. There is no relation between ‘sincerity’ and value as art. The volumes of agonizingly felt love poetry perpetrated by adolescents and the dreary (however fervently felt) religious verse which fills libraries, are sufficient proof of this.

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Unit 2 Standards of Tests for Arguments

Contents

1.0 Introduction

Logic isn't just a good strong hunch that an argument is correct or incorrect. This study unit thus introduces the learner to the four main standards of test for arguments, two of which – *validity* and *soundness* – are for deductive arguments and the other two – *reliability* and *strength* – are for inductive arguments. It teaches the learner the distinction between *truthfulness* and *falsity,* on the one hand, and *validity* and *invalidity,* on the other. It also teaches you how to distinguish between a *valid argument* and a *sound argument* and between *sound* and *unsound arguments*; and how to apply the terms sound and unsound in evaluating argument

2.0 Intended Learning Outcomes

It is expected that at the end of this unit, you will be able to:

1. Use the appropriate logic jargons in evaluating the different types of arguments.
2. Distinguish between valid and invalid arguments
3. Distinguish between a valid argument and a sound argument
4. Distinguish between sound and unsound arguments
5. Identify valid but unsound arguments

6.

2.0 Main Content

When an argument is set forth to prove that its conclusion *is necessarily* true (as opposed to *probably* true), then the argument is intended to be deductive. An argument set forth to show that its conclusion is probably true is regarded as inductive. Because of this difference in the principles that govern the classification of an argument as either deductive or inductive, separate standards of tests are applied in evaluating deductive and inductive arguments.

3.1 The Tests of Deductive Arguments: Validity and Soundness

A deductive argument is one in which the claim is made that some proposition (the conclusion) follows with strict necessity from some other propositions (the premises), that is, that it would be inconsistent or self-contradictory to assert the premises but deny the conclusion. And when the conclusion of an argument follows, from its premises such that if the premises are true the conclusion must of necessity also be true, then the argument is said to be *valid*. Validity in this connection, and which is primary, is a property predicated of arguments, which are such that if the premises are true, the conclusion would have to be true. Validity thus means the same thing as *logically correct*, that is, the conclusion follows logically from the premises; an argument is logically correct because its conclusion cannot fail to be true if its premises are true. To say that an argument is valid is to say that the conclusion really does follow from the premises. That is, an argument is valid precisely when it cannot possibly lead from true premises to a false conclusion; *validity describes the relationship between the premises and conclusion, and it means that the premises imply the conclusion, whether or not that conclusion is true.* In fact, validity relates to how well the premises support the conclusion and is the golden standard that every deductive argument should aim for. An argument that is not valid is said to be ***''invalid''***.

An example of a valid argument is given by the following well-known syllogism:

All men are mortal

Socrates is a man.

Therefore, Socrates is mortal.

What makes this a valid argument is not the mere fact that it has true premises and a true conclusion, but the fact of the logical necessity of the conclusion, given the two premises. No matter how the universe might be constructed, it could never be the case

that this argument should turn out to have simultaneously true premises but a false conclusion. The above argument may be contrasted with the following invalid one:

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

In this case, the conclusion does not follow inescapably from the premises; a universe is easily imagined in which 'Socrates' is not a man but a woman, so that in fact the above premises would be true but the conclusion false. This possibility makes the argument invalid. If an argument is invalid, it will always be possible to construct a counterexample to show that it is invalid. A **counterexample** is simply a description of a scenario in which the premises of the argument are all true while the conclusion of the argument is false.

Logic as the criteria for the evaluation of arguments has as its fundamental task the provision of standards or criteria to judge whether an argument is valid or invalid; that is, logically correct or not. This explains why we say that logic is interested in the completed process of reasoning; the logician does not and cannot tell us what to infer from available information, what he does actually is to tell us whether our inference are logically correct (valid), given available information. In the following example:

All acclaimed beautiful girls are promiscuous
All fair-complexioned girls are acclaimed beautiful
Therefore, fair-complexioned girls are promiscuous

the argument is adjudged valid because the conclusion is derived from the premises; the information provided at the conclusion follows from the information in the premises. The point is that validity is a relationship of logical connection between the premises and the conclusion; the conclusion is derived from the premises. Thus, for the purposes of validity, it doesn't matter whether the premises are *actually* true or false. All that matters for validity is whether the conclusion follows from the premises. You can see that even though the premises and conclusion of the argument are all false, the conclusion – fair-complexioned girls are promiscuous – follows from the premises – All acclaimed beautiful girls are promiscuous and all fair-complexioned girls are acclaimed beautiful. Yet the argument is clearly valid because *if* you assume that "All acclaimed beautiful girls are promiscuous" is true, then, since All fair-complexioned girls are acclaimed beautiful, *it follows* that "fair-complexioned girls are promiscuous" must also be true. Thus, whether an argument is valid has nothing to do with whether the premises of the argument are actually true.

But an argument that is such that the information provided in the conclusion could be true without the premises being so is said to be invalid. That is, in an *invalid argument,* it is possible for the premises of an argument to be true and the conclusion false; the premises of an invalid argument do not entail the conclusion. The conclusion could contain some information not provided in the premises; therefore, it is possible for the premises to be true and the conclusion false.

Although, it is generally said that a valid argument is one such that if the premises are true, the conclusion must necessarily be true also, the point is important that validity and truth are not co-extensive. In fact, arguments are evaluated in terms of validity and invalidity, not in terms of truthfulness and falsity; the attributes of truth and falsity are ascribable to propositions, whereas the attributes of validity and invalidity are ascribable to arguments. In real logic parlance, therefore, it is incorrect to say of an argument that it is true or false as it is also incorrect to say of a proposition that it is valid or invalid. This, however, is not to say that there is no relationship between the truth or falsity of a proposition and the validity and invalidity of an argument.

A valid argument with all true premises and a true conclusion is called a ***sound argument***. A sound argument is one that is not only valid, but begins with premises that are *actually true*. The example given about acclaimed beautiful girls is valid, but not sound. However, the following argument is both valid and sound:

No felons are eligible voters.
Some acclaimed politicians are felons.
Therefore, some acclaimed politicians are not eligible voters.

Here, not only do the premises provide the right sort of support for the conclusion, but the premises are actually true. Therefore, so is the conclusion. Although it is not part of the *definition* of a sound argument, because sound arguments both start out with true premises and have a form that guarantees that the conclusion must be true if the premises are, sound arguments always end with true conclusions. For an argument to be sound it must be valid and all the propositions (the premises and the conclusion) must also be true. According to Susan Haack (1978: 14), *"no argument can be sound unless it is valid."*

It should be noted that both invalid, as well as valid but unsound, arguments can nevertheless have true conclusions. One cannot reject the conclusion of an argument simply by discovering a given argument for that conclusion to be flawed.

3.2 The Tests of Inductive Arguments: Reliability and Strength

An inductive argument does not involve the claim that its premises entail the conclusion; it only claims that the premises provide some evidence for the conclusion.

Inductive arguments thus cannot guarantee the truth of the conclusion, which means they will look like invalid deductive arguments. Indeed, they are sometimes classified as such. This is because, it always possible to produce counterexamples for all inductive arguments; an inductive argument never promises absolute truth. We measure inductive arguments by degrees of **probability** and **plausibility** not absolute categories like validity and soundness. Validity and soundness do not allow for a sliding scale of degrees. They are absolute conditions: There is no such thing as being partially valid or somewhat sound.

Although, logic as the criteria for the evaluation of arguments is naturally more inclined to deductive reasoning than inductive reasoning, more so, that inductive arguments cannot guarantee truth, this, however, does not privilege deductive reasoning and scorn inductive arguments. That is an unfair measure, and it is not practical. The truth is that most arguments we create and evaluate in life are inductive arguments. It might be helpful to think of deductive arguments as those created in perfect lab conditions, where all the ideal parameters can be met. Life is much more complicated than that, and we rarely get ideal conditions. One main reason is that we rarely ever have all the information we need to form an absolutely true conclusion. When new information is discovered, a scientist or historian or psychologist or business executive or a college student should investigate how it affects previous ideas and arguments, knowing that those previous ideas may need to be adjusted based on new information.

Inductive arguments can never lead to absolute certainty, which is one reason science keep studying and trying to add to knowledge. This does not mean, however, that any inductive argument will be a good one. Inductive arguments must still be evaluated and tested, and the two main tests are **reliability** and **strength**.

Test of **reliability**, much like that of validity for deductive arguments, tests an inductive argument's reason, its internal logic. In other words, just because an inductive argument cannot guarantee a true conclusion doesn't mean that it should not be logically constructed. One cannot make just any sort of claim, particularly one that does not have a reliable basis. Reliability, unlike validity, can be measured by degree. More reliable arguments are ones that have a more solid basis in reason. Consider this example:

Ninety-seven percent of politicians are wantonly corrupt (**premise**)
Alhaji Gembu is politician (**premise**)
Therefore, Alhaji Gembu is wantonly corrupt (**conclusion**)

This argument has a high degree of reliability. While it may well be true that Alhaji Gembu is one of the three percent of politicians that are not wantonly corrupt, it is

much more likely, given the initial premise that he is not. If the initial premise changes, however, so does the reliability of the argument:

Thirty-three percent of politicians are wantonly corrupt (**premise**)

Alhaji Gembu is politician (**premise**)

Therefore, Alhaji Gembu is wantonly corrupt (**conclusion**)

Note how the degree of reliability has gone done dramatically. The argument can now be considered unreliable since the conclusion that Alhaji Gembu is wantonly corrupt is improbable given the premises provided. The conclusion still could be true, but it has tipped toward unlikely.

The second test of inductive arguments is **strength**. Strength, like reliability, can be measured by degree. Strong arguments must have the following conditions: (1) They must be reliable arguments; (2) they draw upon multiple lines of reasoning as support and/or a collection of data. Indeed, the more the data and the more the reasons for a conclusion, the stronger the argument. Consider the following argument:

Jane and Godwin has been dating for the past six months (**premise**)

Godwin has never cheated on Jane (**premise**)

Therefore, Jane has every reason to trust that Godwin cannot cheat on her (**conclusion**)

This argument is reasonable; we can see that the premises may logically lead to the conclusion. However, the argument is not very strong as Jane and Godwin has only been dating for the past six months. Is that enough information to make the conclusion a likely one? What if we had more information, like:

Jane and Godwin has been dating for the past three years (**premise**)

Godwin has never cheated on Jane (**premise**)

Therefore, Jane has every reason to trust that Godwin cannot cheat on her (**conclusion**)

This argument, with more data to consider (three years of information instead of just six months), is much stronger. An argument also gets stronger when reasons are added:

Jane and Godwin has been dating for the past three years

Godwin has never cheated on Jane

Godwin is generally known to be chaste and faithful (**additional premise**)

Godwin comes from an exemplary home and is well bred (**additional premise**)

Therefore, Jane has every reason to trust that Godwin cannot cheat on her (**conclusion**)

This argument is even stronger. Not only does it have more data, but it also has additional reasons for Godwin's faithful nature. This point has been foreshadowed in our distinction between weak and strong induction in the immediate preceding unit.

4.0 Conclusion

The standard of test for deductive and inductive arguments differ; deductive arguments are either valid or invalid. The attributes of validity and invalidity apply to deductive, not inductive arguments; it is in deductive inferences that we seek to know whether the conclusion is derived from the premises or not. Inductive arguments are not concerned with validity and invalidity, but with inferences, which are probable given as evidence the truth of certain inferences upon which they are based. Questions important to inductive reasoning are -when does the evidence make the truth of the conclusion more probable than not, or what is the probability that the conclusion is true given the evidence in question? Induction as such is concerned with the reliability and strength of the information or data provided. Validity and soundness do not allow for a sliding scale of degrees. They are absolute conditions: inductive arguments are neither sound nor valid, there is no such thing as being partially valid or somewhat sound.

5.0 Summary

Inductive arguments are unlike deductive arguments; deductive arguments involve the claim that its premises necessitates the conclusion whereas inductive arguments do not involve such a claim; they only claim that the premises provide some evidence for the conclusion; yet like deductive arguments, inductive arguments must still be evaluated and tested. There are four main standards of test for arguments, two of which – *validity* and *soundness* – are for deductive arguments and the other two – *reliability* and *strength* – are for inductive arguments.

6.0 Tutor Marked Assignment

1. Examine each of the following arguments and giving reasons for your answers, state which of the arguments are Invalid, Valid and Sound or Valid and Unsound.

(i) All Popes reside at the Vatican.
John Paul II resides at the Vatican.
Therefore, John Paul II is a Pope.

(ii) No felons are eligible voters.
Some acclaimed politicians are felons.
Therefore, some acclaimed politicians are not eligible voters.

(iii) All legal practitioners in Nigeria have been duly called to the bar.
All Judges of Courts of record in Nigeria have been duly called to the bar
Therefore, legal practitioners in Nigeria are Judges of Courts of record.

(iv) All criminal actions are illegal
All murder trials are criminal actions
Therefore, all murder trials are illegal

(v) All humans are both kind-hearted and tall
All kind-hearted and tall people are wealthy
Therefore, all humans are wealthy

(vi) Nigeria is an ECOWAS member nation
All ECOWAS member nations are dependent economies
Therefore, Nigeria is a dependent economy

(vii) If any ethnic group is in Nigeria then it is predominantly black- complexioned.
The Tiv and Efik ethnic groups are in Nigeria
Therefore, the Tiv and Efik ethnic groups are predominantly black-complexioned

(viii) All Christians are Africans
Nigerians are Africans
Therefore, Nigerians are Christians

(ix) All black-complexioned individuals are hardworking.
All beautiful girls are black-complexioned
Therefore, all beautiful girls are hardworking.

(x) All mammals are vertebrates
All vertebrate creatures are cold-blooded
Therefore, all mammals are cold-blooded

2. Identify which of following statements is true or false.

i A sound argument is a valid deductive argument with true premises and conclusion..

ii A deductive argument cannot be both valid and unsound.

iii All valid deductive arguments are sound arguments.

iv A deductive argument can be either valid or invalid and still have true premises. .

v When the conclusion of a deductive argument is true, the argument must be sound.

vi When the premises of a deductive argument are true, the conclusion is always true as well.

vii If a deductive argument is sound, then the conclusion must be true.

viii A deductive argument could have a false premise and still be sound.

ix In a valid deductive argument the conclusion could be true or false.

x An invalid deductive argument could have all true statements in it.

xi All deductive arguments with true premises are always valid

xii All sound deductive arguments are valid.

xiii All valid arguments have true premises and a true conclusion.

xiv All deductive arguments with true premises and a false conclusion are invalid.

xv All arguments with a false statement in them are unsound.

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Unit 3 Logical Form and Formal Validity

Contents

1.0 Introduction

This study unit introduces the learner to the concept of logical form. It elaborates the point that the validity of an argument is not dependent on the truthfulness and falsity

of the propositions that are embodied in the premises and the conclusion. It thus focuses on the feature of an argument that recommends its validity; that is, the feature of an argument that makes it valid or otherwise invalid. It also exposes the learner to the fundamental nature of logic

2.0 Intended Learning Outcomes

It is expected that at the end of this unit, you will be able to:

1. Clearly understand that the validity of an argument is not dependent on the truthfulness and falsity of the propositions that are embodied in its premises and the conclusion.
2. Clearly understand what actually makes an argument valid or invalid
3. represent the logical form of an argument by replacing the specific content words with letters used as place-holders
4. Identify valid and invalid arguments by examining their logical form
5. Understand that the fundamental nature of logic
6.

3.0 Main Content

Our discourse on validity and invalidity on one hand, and soundness and unsoundness on the other makes it clear that a valid or logically correct argument is not necessarily one with true premises and a true conclusion. We have valid arguments, otherwise called unsound arguments, that have false or a mixture of false and true premises and conclusion. The point on relief, therefore, is that the validity of an argument is not dependent on the truthfulness and falsity of the propositions that are embodied in the premises and the conclusion. The apposite question then is: what feature of an argument recommends its validity? that is, what is it that makes an argument valid or otherwise invalid?

Simply, an argument by virtue of the *form* of the argument, the logical relationship between the premises of an argument and its conclusion is a relationship of form or structure, not of truth and falsity. The import here is that validity depends not on the subject matter or material content of an argument, but on the form or structure.

3.1 Logical Form

Whether or not the premises of an argument are true depends on their specific *content*, but the validity or invalidity of an argument is determined entirely by its *logical form*. The logical form of an argument is that which remains of it when one abstracts away from the specific content of the premises and the conclusion, i.e., words naming things, their properties and relations, leaving only those elements that are common to

discourse and reasoning about any subject matter, i.e., words such as "all", "and", "not", "some", etc. One can represent the logical form of an argument by replacing the specific content words with letters used as place-holders or variables.

For example, consider these two arguments:

All humans are mammals.
No mammals are invertebrates.
Therefore, no humans are invertebrates

All mosquitoes are spiders.
No spiders are animals.
Therefore, no mosquitoes are animals.

These arguments share the same form:

All p is q;
No p is q ;
Therefore, No p is r.

All arguments with this form are valid. Because they have this form, the examples above are valid. However, the first example is sound while the second is unsound, because its premises are false. The schematic representation of the arguments points out that any argument, which has the form, will be valid irrespective of what is substituted for p, q and r. In this connection, the schema in is called *inference form* and the arguments are then instances of the inference form. The letters, p, q, r mark the places into which expressions of a certain type may be inserted. The feature of the schema that guarantees that every instance of it will be valid is its construction in such a manner that every uniform way of replacing its variable to make the premises true automatically makes the conclusion true, too; or in other words, that no instance of it can have true premises but a false conclusion. Now consider:

All humans are mortal
Elephants are mortal.
Therefore, elephants are humans.

All Presidents of Nigeria reside at Aso Rock.
General Buhari resides at Aso Rock.
Therefore, General Buhari is a President.

These arguments also have the same form:

All p is q;
r is q;
Therefore, r is p.

Arguments with this form are invalid. This is easy to see with the first example. The second example may *seem* like a good argument because the premises and the conclusion are all true (at least in 2019), but note that the conclusion's truth isn't guaranteed by the premises' truth. It could have been possible for the premises to be true and the conclusion false. This argument is invalid, and all invalid arguments are unsound.

The import here is that validity depends not on the subject matter or material content of an argument, but on the form or structure. Accordingly, logic as a study of the conditions of validity is a formal discipline. In other words, because the formal structure of an argument determines the validity of an argument, logic is a formal science and its subject matter is formal validity. Logic studies the forms of arguments in order to classify argument forms into two mutually exclusive exhaustive divisions; one division being reserved for formally valid argument forms, the other for formally invalid forms. The object of logic, as a formal science, is thus obtained when logical techniques and methods are available by means of which it is possible, in principle, to identify all formally valid arguments as formally valid, and formally invalid arguments as formally invalid.

That the validity of an argument is a matter of it's *logically form* as opposed to its *content* makes it evident that the test for validity and invalidity does not depend on the truthfulness and falsity of the propositions that make up the argument. *"The attributes of validity and invalidity belong to arguments not to propositions…., the attributes of truthfulness and falsity belong to propositions, not to arguments"* (Copi 1973:3) This point is further buttressed by the following examples of valid arguments with *(i) False premises and False conclusion (ii) False premises and True conclusion,* and (iii) *True premises and True conclusion:*

(i) All black-complexioned individuals are hardworking
All girls are black-complexioned
Therefore, all girls are hard working

A valid argument with false premises and false conclusion

(ii) All Christians are Africans
Nigerians are all Christians
Therefore, Nigerians are Africans

A valid argument with false premises and a true conclusion

(iii) Nigeria is a member of the Economic Community of West African Countries.
Member-nations of Economic Community of West African Countries are categorized as black nations
Therefore, Nigeria is categorized as a black-nation

A valid argument with true premises and true conclusion

But, it is not possible to have as valid, an argument with all true premises and a false conclusion. The result thus is that any argument that has an all true premises and a false conclusion is sure to be invalid; this is because the conclusion of such an argument could not have been derived (deduced) from the premises, the point is that the information in the conclusion cannot be found in the premises, and in all valid arguments the conclusion cannot give any information not already contained in the premises.

The point on relief here is that the test for validity and invalidity does not depend on truthfulness and falsity. In this connection, questions revolving around truth and validity make it necessary that we do not talk of the material truth of propositions in talking about validity and invalidity; indeed, the actual truth of the premises and its conclusion is irrelevant to logic. In talking about the validity of an argument, we are not concerned with whether the premises of an argument and the conclusion are actually true or not but only in their *logical form.*

3.2 Logic: A Science of Formal Validity

The import of the suasion that logic isn't concerned whether the premises of an argument and the conclusion are actually true or not but only in their *logical form* is that logic, properly understood, is a science of formal validity, meaning therefore that logical principles are purely formal. This is illustrated by the example below:

. All men are mortal

Socrates is a man

Therefore, Socrates is mortal

What we mean to assert in this argument is only that the premises imply the conclusion, not that the premises and the conclusion are actually true; the actual truth of the premises is irrelevant to the validity of the argument. As Bertrand Russell (1975: 196 -1 97) pointed out, this becomes clearer if instead of the categorical form of the argument, we now have the same argument couched in propositional form as follows: "If all men are mortal and Socrates is a man, then Socrates is mortal". In this form, the argument does not assert neither of the mortality of all men, nor the humanity of Socrates; the conclusion is thus a matter of implication. In effect, the argument is valid in virtue of its form not in virtue of the particular terms occurring in it.

The point is that if we omit "Socrates is a man" from our premises, we would have a non-formal argument, only admissible because Socrates is in fact a man. In that case, we cannot generalize the argument. But when, as re-formulated, the argument is formal, nothing depends upon the terms that occur in it. What this comes to is that we may as well substituted $\propto$ for men, β for mortals, and x for Socrates, where $\propto$ and β are any classes whatever, and x is any individual, we then arrive at the statement: "No matter

what possible values x and ∝ and β may have, if all ∝ 's and β's and x is an ∝, then x is a β" (Uduma 1994:303).

The gist of the foregoing is that if formal reasoning is what we are aiming at, we shall always arrive ultimately at statements like the above, in which no actual things or properties are mentioned. This will happen through the mere desire not to waste our time proving in a particular case what can be proved generally. Accordingly, Russell (1975: 197) writes:

> it would be ridiculous to go through a long argument about Socrates, and then as though precisely the same argument again about Plato. If our argument is one (say) which holds for all men, we shall prove concerning "x" with the hypothesis "if x is a man". With this hypothesis, the argument will retain its hypothetical validity even when "x" is not a man. But now we shall find that our argument would still be valid if, instead of supposing x to be a man we were to suppose him to be a monkey, or a goose or a Prime Minister. We shall therefore not waste our time taking as our premises "x" is a man" but shall take "x is an ∝ where ∝ is any class of individual.

The import of the above question is that the absence of all mention of particular things or properties in logic is a necessary result of the fact that logic is purely formal. In a sense, logic as a formal discipline is concerned with inference forms rather than with particular instances of them. One of its tasks is to discriminate between valid and invalid inference forms and to explore and systematize the relations that hold among valid ones.

The insight that logic is interested in formal validity here means that logical principles express the most general nature of things. Accordingly, since the general nature of things is the ground for the correctness or incorrectness of reasoning, general nature is also expressed in the principle of logic or inference. In effect, logic studies the nature of anything that is, in Aristotelian (metaphysical) parlance, "it investigates being as being". It is differentiated from other sciences because while the other disciplines examine the properties which distinguish one subject matter from another, logic studies those truths which hold for everything that is, and not for some special subdivision of what is apart from the others.

As a consequence, logical principles must be formal – they represent the common characters of any subject matter, and they cannot be employed to differentiate one subject from another. Logic in this connection involves abstracting to form, and in doing this we require knowledge of only the most general characters of a subject matter, that is, that which it has in common with everything else, in order to reasons upon it validly.

4. 0 Conclusion

Logic as a study of the conditions of validity is a formal discipline. In other words, because the formal structure of an argument determines the validity of an argument, logic is a formal science and its subject matter is formal validity. Logic studies the forms of arguments in order to classify argument forms into two mutually exclusive exhaustive divisions; one division being reserved for formally valid argument forms, the other for formally invalid forms. The object of logic, as a formal science, is thus obtained when logical techniques and methods are available by means of which it is possible, in principle, to identify all formally valid arguments as formally valid, and formally invalid arguments as formally invalid.

5.0 Summary

Logic as the criteria for the evaluation of arguments is primarily concerned with the validity and invalidity of arguments. And the determination of validity and invalidity depends on the form or structure rather than the contents or materials of arguments. In essence, logic is a formal discipline which takes as its main subject matter propositions and deductive arguments, and abstracts from their content(s) the structure or logical forms that they embody. Thus, because logic is interested in the forms and their connections, apart from any matter, which an argument may exemplify, logic is the science of (pure forms) formal validity.

6.0 Tutor Marked Assignment

Give the Logical form of the following arguments and identify those, which have the same form; state also, which of the arguments are valid or invalid.

(1) All professionals are skilled and have expertise
All who are skilled and have expertise know their worth
Therefore, all professionals know their worth

(2) Residents of Ghana-Ama are scholars
Residents of Gambia-Ama are scholars
Therefore, residents of Ghana-Ama are residents of Gambia-Ama

(3) All black-complexioned people are Africans
Nigerians are black complexioned
Therefore, Nigerians are Africans

(4) All hardworking people are successful
All good scholars are successful
Therefore, all good scholars are hard working

(5) All police officers are sadists
Adeyemi is a police officer

Therefore, Adeyemi is a sadist.

(6) All dogs are reptiles
All reptiles are Martians
Therefore, all dogs are Martians

(7) All dogs are mammals
Some mammals are pets
Therefore, some dogs are pets

(8) All ducks waddle
Nothing that waddles is graceful
Therefore, no duck is graceful

(9) All teenagers are eligible voters
Some teenagers are stupid
Therefore, some eligible voters are stupid

(10) All birds can fly
Some mammals can fly
Therefore, some birds are mammals

(11) All cats are vertebrates
All mammals are vertebrates
Therefore, all cats are mammals

(12) All dogs are ferocious
Some ferocious animals are flea-bags
Therefore, some dogs are flea-bags

(13) All turtles are reptiles
No turtles are warm-blooded
Therefore, no reptiles are warm-blooded

(14) No dogs are cats
No cats are apes
Therefore, no dogs are apes

(15) No mammals are cold-blooded
Some lizards are cold-blooded
Therefore, some mammals are not lizards

Identify which of the following inference forms are valid and those, which are valid:

(1) All p's are q's
r is q
Therefore, r is p

(2) All p's are q's

r is p
Therefore, r is q

(3) All p's are q's
q is r
Therefore, p is r

(4) All p are q's
q is r
Therefore, r is p

(5) All p's are r
q is p
Therefore, q is r

(6) No p is q
Some p is r
Therefore, No q is r

(7) All p is q
No p is r

(8) All p is q
All r is q
Therefore, all r is p

(9) No p is q.
Some r is p
Therefore, some r is q.

(10) All p is q.
All r is q
Therefore, all p is r

(11) All p is q
All r is p
Therefore, all p is q

(12) All p is q
All q is r
Therefore, all p is r

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Module 3 Categorical Propositions

Contents

1.0 Introduction

The study of arguments using Categorical Propositions, has from antiquity been found as the chief embodiment of deductive reasoning, this study unit, therefore, introduces the learner to a more precise study of deductive reasoning.by focusing on Categorical propositions.

2.0 Intended Learning Outcomes

It is expected that at the end of this unit, the learner will be able to:

1. Understand the logical structure of individual categorical propositions (how the subject and predicate classes relate to each other),
2. Understand how correct reasoning proceeds from one categorical proposition to another.

3.0 Main Content

3.1 Meaning and Structure of Categorical Propositions

Ordinarily, the term "categorical" is an adjective, which means *"unqualified"*, "*absolute*" or *"explicit"*. In this context, categorical propositions are propositions, which assert something to be such and such or not to be such and such without qualification or restriction. That is, propositions which *unconditionally* affirm or deny something. For example, the following propositions:

(1) Students are not all hardworking
(2) Only the faithful will inherit the kingdom of God.
(3) Good academics have lost faith in the present day quality of scholarship.
(4) Some philosophers have not been convinced as to be existence of God

Because each of them unconditionally, that is without restriction, affirms or denies something of something they are all classifiable as categorical propositions.

The above examples of categorical propositions as indeed all categorical propositions, irrespective of their linguistic forms, can be reduced to certain basic formulations. Accordingly, an analysis of any categorical proposition will exhibit that it will contain (a) a "*subject term"* (b) a *"predicate term"* (c) the *"copula"*; and (d) a *"quantifier".*

The subject term designates the referent about which something is affirmed (asserted) or denied; the *predicate term* specifies that which is being affirmed or denied of the referent; the *copula* indicates either affirmation or negation; and, the *quantifier* is a linguistic symbol showing whether the assertion is made about *all* or about *some* of the referent (subject).

3.2 Standard-Form Categorical Propositions

A categorical proposition is formed by bringing the *subject* and the *predicate terms* together with the aid of the copula. Thus, if a proposition asserts or denies something about a *subject*, say Nneoma, and that which it asserts or denies about Nneoma, that is, the predicate, is for example, "intelligent"; we can bring the subject term "Nneoma" and the predicate term "intelligent" together by placing between the two terms; the verb "to be" "is" or "is not" to yield "Nneoma is intelligent" or "Nneoma is not intelligent". In the first product of connecting the subject term with the predicate term that is "Nneoma is intelligent" the copula expresses a relation of affirmation between the subject and the predicate, and so the proposition is said to be affirmative. But in "Nneoma is not intelligent", the copula expresses a relation of denial between the subject and the predicate terms in joining them and this is called negative.

3.2.1 Quality and Quantity

An *affirmative proposition* asserts that the subject term (or part of the subject term) is included in the predicate term. On the other hand, a negative proposition asserts that the subject term (or part of the subject term) is excluded from the predicate term. In either affirming or denying the predicate of the subject, the copula determines the *quality* of the proposition. In other words, classification of propositions as affirmative or negative are said to be a concern with the *quality* of the propositions, and this quality of affirmation or negation belongs to the copula, not to either or both of the terms. As a matter of fact, a proposition may have negative terms and still be affirmative, or it may have positive terms and still be negative. For example, the proposition: "Some (students who do not understand the lecture) are (those who do not ask questions) is an affirmative proposition with negative terms. Similarly, the proposition: "Some (students) are not

(hardworking) is a negative proposition with positive terms. The point underscored therefore is that the negation of terms is not the same as the negation of the copula and vice versa.

It is, however, notable that all terms can be interpreted as names of classes. In this respect, the subject and predicate terms of categorical propositions are interpreted in terms of class relationship. A *class* here means the collection of all objects that have specified characteristics in common. There are, as it were, various ways in which classes may be related to each other. The term *class membership* is thus used to refer to the relation of individual objects to the class which they are members. For example, the individual numbers: "one", "three", "five", "seven", "ten", "twenty", 'five hundred", "three thousand and forty" are members of the class *numbers*. In this sense, if every member of one class is also a member of a second class, then the first class is said to be included or contained in the second. If, on the other hand, some, not all members, of one class are also members of another, then the first class may be said to be partially contained in the second class.

In applying class membership in the context of our analysis of categorical propositions, if a proposition predicates something of *all* members of the class designated by its subject term, it is called a *universal proposition*. If it predicates something of an indefinite part of that class, it is called a *particular proposition.* Universal propositions are characterized by the *"quantifiers"* or prefixes *"All"* or *"No"*; particular propositions have the prefix *"Some"*.

It is nevertheless important to point out that the prefixes *all* and *some* are somewhat ambiguous, hence the need for interpreting them correctly in our context. The word *all* may mean "all taken together, collectively" (as in "All professionals receive better treatment than artisans"); or it may mean "each and every one, taken severally" (as in "All professionals receive better treatment than artisans"). If *all* is used as the prefix of a proposition, it must always be taken in the second sense, i.e. it must always be taken as meaning "each and every member of the class taken severally"; for whatsoever that universal proposition asserts, is asserted about each and every member of the subject class, not about a collective whole.

The word *some* also has two distinct meanings, namely, (1) "Some but not all" i.e. "only some"; and (2) "some and perhaps all", i.e., "at least one. For our purpose, the second meaning of "some" prevails because it imposes no questionable restrictions upon thinking and implies a bare minimum of assertion.

An analysis of the constituent elements of categorical propositions gives a classification of such propositions into the following:

(1) those that are *Universal* and *affirmative*

This type of proposition is called Universal affirmative proposition and it takes the form of

All (- - -) is/are (- - -)

Propositions of this type assert that the entire denotation of the subject term is included in the predicate class.

Universal Affirmative propositions are known as "*A*" propositions. If, however, the subject term of an "*A*" proposition is indefinite in denotation, that is, if it designates an unspecified number of individuals, the proposition is said to be an "*A*" general; for example: All (students) are (hardworking).

If on the other hand, the subject term of a universal affirmative or *A* – proposition refers to a class which has only one member, it is called an *A singular.* For example, ("The Press) is (the hope of the masses).

It is notable that for most logical processes singular affirmative propositions are taken as *A* propositions.

(2) Propositions that are *Universal* and *negative*

This type of proposition is called Universal Negative propositions, and it takes the form of

No (- - -) are/is (- - -)

Universal Negative propositions assert that the entire denotation of the subject term is excluded from the predicate class. They are designated as *E* – propositions.

If, however, the subject term of an *E* – proposition is indefinite in denotation, the proposition is called an *E* – *general*; for example, No (students) are (artisans). If, on the other hand, the subject term of an *E* – proposition designates a class which has only one member, the proposition is an *E-singular*; for example,

(The Civil War) is not (a historical accident).

As in the case of Universal affirmative propositions, an *E*-singular is treated as an *E*-general; and it is required in this connection that it must be written in the form of an *E*-general.

(3) Propositions that are *Particular* and *affirmative*

called Particular Affirmative propositions, this type of proposition takes the form of

Some (- - -) are (- - -)

Particular Affirmative propositions assert that only part of the members of the class referred to by the subject term is included in the predicate class. They are known as *"I"* propositions.

However, since the subject term of all particular propositions is indefinite in denotation, these propositions are *always general.* Nevertheless, it may for some purposes, be significant to distinguish between various "degrees of indefiniteness" in

denotation. The following three types of particular affirmative propositions may thus be obtained:

(a) ***Basic Particulars***
Some students are hardworking
Some training is required

(b) ***Plurative Particulars***
A few students have registered
Many lawyers enjoy reading detective novels
Most philosophers are free-thinkers

(c) ***Numerical Particulars***
Eight journalists were arrested
Fifty percent of the lecturers are qualified for advancement

It is obvious from these examples that statements of the types exemplified under *plurative* and *numerical* particulars are more specific and therefore give more information than statements exemplified under B*asic Particulars.* This notwithstanding, for purposes of formal logic, all of these kinds of propositions take the basic form of an 1-proposition;

Some (- - -) are (- - -) *I*

Thus a proposition such as "ninety – eight percent of the unionist voted for the strike action" becomes or is equivalent to "Some (Unionists) are (those who voted for the strike action)"

(4) Propositions that are *Particular* and *negative*

This type of proposition is called Particular Negative proposition and it takes the form of

Some (- - -) are not (- - -)

Particular negative propositions assert that some of the members of the class designated by the subject term are excluded from the predicate class. Propositions of this type are called *O*-propositions.

O-propositions, like *1*-propositions are *always general;* this is for the same reason already explained. Furthermore, the distinction between basic particulars, plurative particulars, and numerical particulars holds for *O*-propositions as well as for *1*-propositions, and, in one case as in the other for purposes of (formal) logic, all of these propositions take the form of the basic particular:

Some (students) are not (prepared for the forthcoming examination) – *O*.

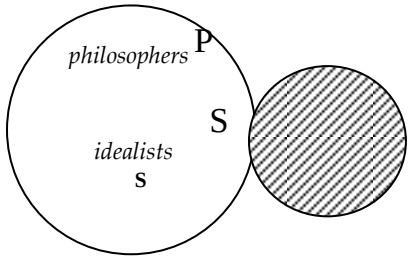
The letters *A, E, I,* and *O* which are traditionally used to identify the different types of categorical propositions are taken from the Latin words *affirmo* (to affirm) and *nego* (to negate, to deny). The first vowel refers to particular propositions. Thus from the two Latin words *Affirmo* and *Nego* we take the first vowels in each that is *A* and *E* to represent Universal propositions; and the second vowels in each, that is *1* and *O* to represent Particular propositions. The Latin words from which the letters are taken indicate the affirmative or negative quality of the proposition, *A* and *I* from *Affirmo*, *E* and *O* from *Nego*.

Using *S* and *P* to represent the subject term and the predicate term of categorical propositions and writing the letters used to identify the different types of categorical propositions between the S and P, the standard form categorical propositions may be represented and exemplified as follows:

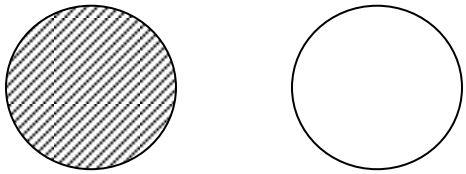
Abbrev.	**Quantity**	**Quality**	**Form**	**Example**
A	Universal	Affirmative	All S is P **(S*a*P)**	All men are mortal
E	Universal	Negative	No S is P **(S*e*P)**	No men are mortal
I	Particular	Affirmative	Some S is P (S*i*P)	Some men are mortal
O	Particular	Negative	Some S is not P **(S*o*P)**	Some men are not mortal

3.2.2 Diagrammatic Representation of Standard Form Categorical Propositions

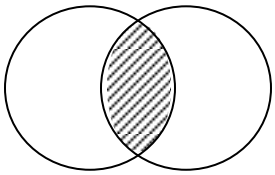
Each of the four types of standard form categorical propositions can be represented by a diagram. The Swiss mathematician and logician Leonard Euler (1707 – 1803) was the first to represent standard form categorical propositions by two circles in showing how the relation of any given two terms can be represented. Using the Euler diagrams therefore, the relationship between the subject term and the predicate term as expressed in the standard form categorical propositions can be represented as follows:



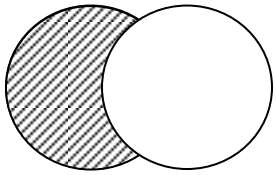
*A: All S is P (S**a**P)*



E: No S is P (SaP)



I: Some S is P (SiP)



*O: Some S is not P (S**o**P)*

3.2.3 Distribution of Terms

The concept of ***distribution of terms*** in general, relates to the interpretation of terms as class names. In this sense, the distribution of terms pertains to the *number of members* of a class to which the term defining that class is meant to apply at any given time. A term is distributed when it is meant to apply to all members of the class which it defines; and it is undistributed when it is meant to apply to only an indefinite part of those members. The term "*dog"*, for example, is distributed when it is so used to refer to all dogs: "Dogs are carnivorous animals"; it is *undistributed* when it is so used as to designate only *some* of the dogs: "Some dogs are friendly".

In discussing categorical propositions, it has also been shown that some propositions assert something of *all* (universal propositions) the members of the subject term or class whereas others affirm or deny something of *only some* of those members (particular propositions). This, together with the point made to the effect that all terms may be interpreted as designating classes bring us to a consideration of how distribution of terms is applied in categorical propositions.

If we consider, first, the case of an *A* – proposition: "All politicians are businessmen"; "All horses are quadrupeds". In all such cases, the subject term is

obviously intended to include *all* members of the class which it defines; the prefix or quantifier, "All", leaves no one in doubt as to this. The term of an *A* – proposition is, therefore, *distributed.* But the predicate terms of *A*- propositions are not distributed. In our example, it is clear that we did not say that only politicians are businessmen as well as it not only horses that are quadrupeds.

If we consider *E* propositions, such as "No politicians are businessmen"; "No undergraduates are scholars", it is obvious that the subject term of these propositions are distributed; for whatever is denied of the subject class is meant to be denied of each and every member of that class. In other words, in *E* – propositions, *all* members of the subject class are excluded from membership in the predicate class. Thus, the subject term of an *E* – proposition is distributed. In saying that all members of the subject class are excluded from membership in the predicate class, we also assert that no member of the predicate class is a member of the subject class. Thus, in saying, "No politicians are businessmen", we are also saying "No businessmen are politicians", the class of people that are businessmen are excluded from the class of people that are politicians. What this means is that the predicate terms of *E* – propositions are equally distributed.

I-propositions assert that *some* of the members of the subject class are members of the predicate class: "Some politicians are businessmen"; "Some students are rich". The subject term of such *I*-propositions is *undistributed,* for the quantifier, "some" indicates that not all members of the subject class are referred to. It is also evident that the predicate term of an *I*-proposition is likewise *undistributed.* In saying, "Some students are rich" or "some politicians are businessmen", we are not saying something about every student or about every rich person neither are we saying something about every politician or every businessman. Because in both statements, we are saying something about *some,* both the subject and predicate terms are undistributed.

Finally, *O*-propositions assert that *some* of the members of the subject class are not included in the predicate class, for example, "Some people are not hardworking". The subject term like for *I*- propositions as indicated by the quantifier is undistributed. But the predicate term is distributed because the quantifier "some" applies to only the subject. The predicate. *Hardworking* is referring to all cases of hardworking; it says that among all the members of the class of hardworking people, some are students.

From the foregoing, it is clear that: (1) Universal propositions distribute their subject term; particulars do not; and (2) Negative propositions distribute their predicate term; affirmatives do not. We can also summarize the distribution analysis in a way to make it convenient using circles to show distributed terms and underlining to indicate undistributed terms as follows:

A All (S) is <u>P</u>

E No (S) is (P)

I Some S is P

O Some S is (P)

However, the distribution of terms may not appear quite important, but it is actually exceedingly necessary to know clearly at all times whether or not certain terms are distributed; for, if a term is undistributed in a given proposition, it cannot be employed with full distribution in any proposition which is derived from the given. The reason is that what is true of *some* members of a class is not necessarily true of *all* members of that class. To therefore reason directly from *some* to *all* is to commit a fallacy; and to reason from an undistributed term to that term in its full distribution is to reason from *some* to *all* hence it is likewise an error in reasoning.

The reverse procedure, going from full distribution to a restricted distribution of a term, is logically warranted; for what is true of *all* members of a class must necessarily be true of *some* members of that class.

From this, the rule governing the distribution of terms may therefore be stated as follows:

If a term is undistributed in a given proposition, it cannot be distributed in any proposition which is logically derived from the given

From "Some flowers are fragrant" we can derive neither the propositions "All flowers are fragrant" nor the proposition, "All fragrant things are flowers". Any attempt to derive these propositions from the given involves a violation of the rule governing the distribution of terms.

Similarly, and for the same reason, we cannot derive "No lawyers are honest" from the proposition "Some lawyers are not honest"; "All mortal beings are humans" from "All humans are mortal".

4.0 Conclusion

To facilitate our understanding of deductive reasoning, there is need to clearly understand the structure and characteristics of categorical propositions. The ultimate goal of our study of categorical propositions, however, is to give a theory of deduction, *i.e.*, to explain the relationship between the premiss(es) and conclusion of a valid argument and provide techniques for the appraisal of deductive arguments.

5.0 Summary

A categorical proposition is a proposition that relates two classes of objects. Categorical propositions contain a subject and a predicate term. The subject term comes first in a standard-form categorical proposition. The predicate term comes second in a standard-form categorical proposition.

A standard-form categorical proposition has a quantity and quality, and a specific distribution method for the subject or predicate term (or both). "Universal" and "particular" refer to the quantity of a categorical proposition. "Affirmative" and "negative" refer to the quality of a categorical proposition. The words "all," "no," and "some" are called "quantifiers." They tell us the extent of the class inclusion or exclusion. The words "are" and "are not" are referred to as "copula." They are simply forms of "to be" and serve to link (to "couple") the subject class with the predicate class. If a categorical proposition asserts something definite about every member of a class, then the term designating that class is said to be *distributed*. On the other hand, if the proposition does not assert something definite about every member of a class, then the term designating that class is said to be *undistributed*.

6.0 Tutor Marked Assignment

1. Name the constituent parts of categorical propositions.
2. How many forms of categorical proposition do we have? Name them
3. Identify the subject and predicate terms and name the form of each of the following propositions
   - i Some philosophers that are atheist and non-conformists are not persuaded by the tantrums of the so-called men of faith.
   - ii All layers of distinction are not attorneys who engage in charge and bail.
   - iii No students who have not themselves worked hard for their examinations are reliable protesters on the need for a shift of examination.
   - iv No footballers who have ever won the African footballer of the year in the past six years are home based players.
   - v Some African novelists are exceptionally good that they can win the Nobel prize.
   - vi No candidates that are unpopular are to be nominated for the primaries in preparation for the next general election.
   - vii Some pastors that are well-educated are not desperadoes who use the bible for mischievous ends.
   - viii All legislators that are currently serving a third term are very likely to be dropped by party notwithstanding the gains of ranking legislators.
   - ix Some politicians who could not be elected to the most minor positions are appointed officials in our government today.

x Some essays written by graduates who are said to have in second class honours are not works that can pass for a product of a secondary school dropout.

4. Name the types of particular affirmative propositions.
5. Identity the type of particular affirmative propositions used in each of the following propositions
   i. A few students have submitted their long essay.
   ii. Some music is stirring
   iii. Eighty five percent of the people desire a change in their social position.
   iv Most students are afraid of Logic courses
   v. Many lecturers appreciate hardworking students
   vi Some villages are thickly populated
   vii Twenty students scored A in Logic and critical thinking
   viii Some lawyers are suffering of personality crisis
   ix Most great scholars are not populists
   x There are great thinkers who are not atheists.

6. Name the quality and quantity of each of the following propositions, and state whether their subject and predicate terms are distributed or undistributed.

i. Some recent rulings of the Supreme Court were politically motivated decisions that raises serious as to the neutrality of the apex court.
ii. No leader of the rival party is an acclaimed democrat
iii. All good looking girls are potential victims of rape by armed robbers
iv. No medicine students or imposters are qualified to enter for the essay competition.
v. Some council chairmen will be roundedly disgraced in the forth-coming polls.
vi. All who escaped the Odi massacre were victors over armed brutality and official hypocrisy.
vii. Some recently published works are actually worthy of a good academic.
viii. Some acclaimed advocates of major political, social and economic reforms are more responsible people who have a stroke in maintaining the status quo.
ix. All genuine advocates of credible electoral process at any cost are statesmen to be remembered, if for nothing for having failed to support the anti-democratic steps of the past administration.
x. No levers are extremely costly.

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Unit 2 Reduction of Ordinary Language Expressions into Standard Form Categorical Propositions

1.0 Introduction
2.0 Intended Learning Outcomes (ILO's)
3.0 Main Contents
Reduction of non-standard form propositions into the standard form
4.0 Conclusion
5.0 Summary
6.0 Tutor Marked Assignment

7.0 References/Further Reading

1.0 Introduction

This study unit introduces the learner to how non-standard form propositions can be analyze d and expressed in the standard form categorical propositions.

2.0 Intended Learning Outcomes

It is expected that at the end of this unit, you will be able to:

1. Reformulate ordinary English Language expressions into standard-form categorical propositions without distorting or changing its meaning.

3.0 Main Contents

Reduction of non-standard form propositions into the standard form

It is obvious that sentences of ordinary English Language are not always, in fact are seldom, stated in standard form categorical proposition. Reasoning in everyday life, as we know, people do not talk in standard categorical form. Categorical form is thus much too stilted for writing effective discourse Nevertheless, notwithstanding that there are a variety of forms or structure in which the sentence of English Language are expressed, it is possible to analyze and express these rather non-standard form propositions into the standard form of *A, E, I,* and *O* propositions.

This process of translating non-standard form proposition to standard form proposition is called ***reduction to Logical Form or Standard Form.*** To reduce a nonstandard form proposition to standard form what is actually crucial is our ability to understand the given non-standard form proposition, so that we can reformulate it without distorting or changing its meaning. In this connection, it is customary, we first have to find out the subject term of the proposition by determining what or that about which the statement is asserted or denied. Next, we have to find out the extent of the assertion of the subject term, that is, what quantity (or number) of subject is affirmed or denied of the subject. Finally, we have to find that which is being affirmed or denied of the subject. The second step gives us the quantifier, the first, the subject term and then we use the copula to connect this to the predicate term, which is what the third step gives us.

In reducing to logical form the following rules of thumb are a good guide.

1. The subject and predicate terms must be the names of classes.
   (a) If the predicate term is descriptive phrase, make it a substantive (i.e. noun phrase)
   (b) Translations must not (significantly) alter the original meaning of the sentence.

(2) Categorical propositions must have a form of the verb "to be" as the copula in the present tense.

(3) The quality and quantity indicators are set up from the meaning of the sentences.
   (a) Quantity indicators "All", "No", "Some". Quality indicators "No", "are", "are not".

(4) The word order is rearranged according to the sense of the sentence.
   (a) This rule requires special care – in some instances, it may well be the most difficult rule to follow
   (b) On occasion, we need to divide one sentence into two or more propositions.

It is remarkable here that the above technique is not a set of rules for dealing with nonstandard propositions, they are indeed guides rather than rules and in the following instances, discussed below what have been given as the techniques should also not be regarded as rules.

(a) Singular Propositions

Singular propositions such as "Ugochinyere is beautiful" and "This handset is not attractive" do not affirm or deny the inclusion of one class in another, as standard form propositions do. But, as already adumbrated, we interpret singular propositions as propositions dealing with classes and their interrelations. In this connection, to every individual object there corresponds a unique *unit class* (one-membered class) whose only member is that object itself. Accordingly, to assert that an object ***S*** belongs to a class ***P*** is logically equivalent to asserting that the unit class ***S*** containing just that object ***S*** is wholly included in the class ***P***. And to assert that an object ***S*** does not belong to a class ***P*** is logically equivalent to asserting that the unit class ***S*** containing just that object ***S*** is wholly excluded from the class ***P.*** It is, however, customary to make this interpretation automatically without any notational adjustment. Thus, as already stated, it is usual to make any affirmative singular proposition of the form ***"S is P"*** as if it were already expressed as the logically equivalent ***A*** – proposition *"All S is P"*; this is what we mean when we talked of *A singular*. Similarly, any negative singular proposition *"S is not P* is an alternative formulation of the logically equivalent *E* proposition *"No S is P"* – in each case understanding ***"S"*** to designate the unit class whose only member is the object ***S***; this is what we had referred to as *E – Singular*.

(b) Categorical Propositions with no Specific Linguistic Quantifier

Singular propositions as discussed above do not really pose much difficulty when we are reducing to logical form. But if a given statement with no specific linguistic quantifier is general, the reformulation of such a proposition would not be so clear and automatic. It is nevertheless also customary to interpret such statements as Universals. For example "Lawyers assert that where there is society there is law" reduces to "All

(lawyers) are (persons who assert that where there is society there is law) "*A*"; "Snakes are reptiles" reduces to "All (snakes) are (reptiles)" *A*; "Philosophers do not accept dogmas" reduces to "No (philosophers) are (persons who accept dogmas)" *E*.

But, there are statements of this type, which cannot be interpreted as universal propositions without being falsified; for example, "Students are boxes". This statement is asserted as true, but it is true only if it is interpreted as a particular proposition: "Some (students) are (boxes)" *1***.** "Knowledge is not restricted to the realm of science"; this cannot possibly mean that "*No knowledge is restricted to the realm of science, and be true*". It is unarguable that the realm of science involves a special type of knowledge which can be obtained only by scientific procedures and which, in this sense, is restricted to the sciences. The proper interpretation of the statement is then given by an *O*– proposition: "Some (knowledge) is not (that which is restricted to the realm of science)" *O*. The point therefore is that where there is no specific linguistic quantifier, what the sentence is intended to express may be doubtful; the context within which such proposition is give must determine how it is to be interpreted.

(c) Propositions with Inverted Terms

The terms of a proposition are sometimes inverted in a given statement; for example, "happy is the man who has such a wife". A statement such as this must be changed, in conformity with its meaning to read: "All (men who have such a wife) are happy". "On the top of the cupboard, lying carelessly and dejected, was the child who had been reported missing", this reduces to All (the child who had been reported missing) is (the person who was on the top of the cupboard, lying carelessly and dejected) – *A*. It is undoubted that in reductions of this kind, all "literary" qualities of the original statements are lost, but logic is not concerned with literary qualities, only with explicit formulations of intended logical meanings. Logic as a matter of fact is concerned only with definitional meanings and with the interrelations of such meanings.

(d) Propositions containing qualifying clauses which are separated from the words which they qualify

At times, the original statement of a proposition contains qualifying clauses which, for literary effects, are separated from the words which they qualify. For example, "No one who need despair who is doing his best to help his fellowmen". "All trucks have left that were loading here last night". To reduce propositions of this kind, the qualifying clauses have to be put close to the words which they modify. Thus, we have: "No (person who is doing his best to help his fellowmen) is (one who need despair)" – *E*; "All trucks that were loading here last night) are (those which have left)" *A*.

(e) Categorical propositions that have adjectives or adjectival phrases as predicates, rather than substantives

This is akin to the type discussed in d above; they differ from standard-form categorical propositions in that their predicates designate *attributes* rather than classes. However, because every attribute determines a class, the class of things having that attribute, every proposition that is such that its predicate designates attribute corresponds logically to that standard form. Thus the propositions "Some girls are beautiful" and "No air-conditioners are available for repairs" correspond to *I* and *E* propositions; in logical form they reduce to "Some (girls) are (beauties)" and "No (air-conditioners) are (things available for repairs)". The point of note here is that where a categorical proposition is in standard form except that it has an adjectival predicate instead of a predicate term, the reduction to standard-from is made by replacing the adjectival predicate with a term designating the class of all objects of which the adjective may truly be predicated.

(f) Categorical propositions whose main verbs are other than the standard-form copula "to be".

In applying reduction to propositions of this kind, the procedure is to regard all of it, except the subject term and the quantifier, as naming a class-defining characteristic. Those words can then be replaced by a term designating the class determined by that class-defining characteristic and may be linked to the subject with a standard copula. For example, 'All philosophers love sound argument" reduces to "All philosophers are lovers of sound argument"; "No mind has ever conceived such an entity as heaven" reduces to "No mind is a conceiver of such an entity as heaven;" 'Some touts smoke marijuana" reduces to "Some touts are smokers of marijuana" etc.

(g) Categorical propositions whose quantifiers are other than "All", "No" and "Some"

Frequently some quantifiers other than "all", "no" or "some" is used in the formulation of propositional statements. In this context, words like "Any", "whosoever", "whoever", "who", "every", "everyone", "none", "nothing" need to be translated to standard form. It is not difficult to transform signs of quantity of this kind. In fact, these quantifiers all express Universal propositions. "Any donations will be acknowledged" reduces to "All donations are things which will be acknowledged"; "Whoever passes the examination will be awarded scholarship" reduces to "All persons who pass the examinations are persons who will be awarded scholarship". "Every student has a registration number" reduces to "All students are persons that have registration numbers"; "None failed the quiz" reduces to "No persons are individuals who failed the quiz"; "Nothing is more gratifying than a compliment" reduces to "No gesture is more gratifying than a compliment".

(h) Categorical propositions whose quantity are indicated by the definite and indefinite article "the" "a" or "an"

The grammatical particles "the", "a" and "an" are also used to indicate quantity but in reducing propositions of this kind the meaning to attach to each of them is largely dependent on the context. Thus "The poet if a popularizer of ideas" reduces to "All poets are popularizers of ideas"; "A thing of beauty is a joy forever" reduces "All things of beauty are things which are a joy forever"; "An armed robber is a threat to lives and property" reduces to "All armed robbers are threats to lives and property". In all these examples the grammatical articles in each expresses a Universal Affirmative proposition. But if we consider propositional statements such as "A student was expelled"; "An engineer won the contract", it is obvious they do not refer to "All students or All engineers. Accordingly, properly reduced, these statements mean "Some students are expelled" and "Some engineers won the contract".

(i) Exclusive propositions

Categorical propositions involving the words "only", "none" "but" "alone" are often called *exclusive propositions* because in general they assert that the predicate applies exclusively to the subject named. In other words, they exclude an indefinite number or quantity of *things* from membership in the subject class and do not designate in any way whether or not the subject class has members at all. This is illustrated in the following examples:

(1) "Only duly registered students can sit for the examination"
(2) "Only anarchists believe in political chaos
(3) "None but a man in love will tolerate her antics
(4) "God alone is ubiquitous"

The first reduces to "All those who can sit for the examination are duly registered students"; the second reduces to "All those who believe in political chaos are anarchists; the third reduces to "All those who will tolerate her antics are men in love"; and, finally, the fourth reduces to "All ubiquitous beings is God".

On the face of it, and in fact it is conventional to translate exclusive propositions into *A* propositions. In this respect, the general rule is to reverse the subject and the predicate and replace the "only" with "All", "None but" with "All" and "alone" with "All".

Another way of reducing exclusive propositions is to translate it to an *E*-proposition with negative subject term. In this connection, the first original proposition reduces to "No non-registered students are persons who can sit for the examination"; the second original proposition reduced to "No non-anarchists are persons who believe in

political chaos"; the third original proposition reduces to "No man who is not in love is a person who will tolerate her antics; and, the fourth proposition reduces to "No other being than God is ubiquitous".

Exclusive propositions may thus be reduced to as either *A* or *E* proposition depending upon what use is to be made of them in a formal argument.

(j) Exceptive Propositions

Some propositions begin with "all but" or "all except". They are called *Exceptive propositions* and must be distinguished from exclusive propositions. "All but five members of this class were called to bar"; "All except top government officials are opposed to deregulation"; "All Nigerian students except medical students are to protest the recent increases in fees". Propositions of this type cannot always be reduced to standard form, for they actually carry the meaning of two distinct propositions. In some cases, it is possible to formulate them as *A*-propositions with negative subject terms: "All persons who are not top government officials are opposed to deregulation"; but even this translation does not contain the negative aspect of the original, namely, that "the top government officials are not opposed to deregulation". In other cases, the device of the negative subject term cannot be employed at all, and it is necessary to separate the two intertwined propositions and to assert them conjointly: "five members of this class were not called to bar *and* the others were called to bar"; "medical students are not to protest the recent increase in fees and all other Nigerian students will protest the recent increase in fees". This is admittedly a rather cumbersome procedure, but it is the best that can be done with exceptive propositions. It is notable however, that in exceptive propositions one of the component members is negative; the other is affirmative.

(k) Propositions which begin with "few" or "a few".

Some examples are: 'A few people have succeeded in demystifying occultism"; "A few philosophers are not opinionated". Proposition such as these, which start with "a few", do not pose much trouble to reduce them to standard form. If the proposition is affirmative, it must be written as *I* – proposition; if it is negative, it must be written as *O*-proposition. In the case of an affirmative, the proposition affirms that "some" *actually have, do,* or *are.* "A few people have" is equivalent to "some people actually have succeeded in demystifying occultism": "Some people are men who have succeeded in demystifying occultism". In the case of negative propositions they assert "some" *actually have not, do not,* or *are not:* "A few philosophers are not" is equivalent to some philosophers are actually not opinionated: "Some philosophers are not persons who are opinionated".

The case, however, is not so clear when a proposition begins with "few". "Few people doubt the reality of heaven"; "Few people believe that philosophers can ever be

religious". Such propositions do not state that "some" *have, do* or *are;* they assert rather that "most" *have not, do not* or *are not.* The meaning of "few", in other words, is really equivalent to *"few, if any"*. It asserts as a certainty that "Some (- - -) are not (- - -)" and leaves undecided the question whether or not "Some (- - -) are (- - -)". The import of the word "few" is therefore to make the proposition an *O*-proposition. "Few, if any people doubt the reality of heaven"; i.e., *most* people do not, and none actually may, doubt it; hence, "Some people are not persons who doubt the reality of heaven". "Few, if any person believe that philosophers can ever be religious" i.e., most people do not, and non-actually may, believe it, therefore, "Some people are not persons who believe that philosophers can ever be religious".

In some cases of propositions of this type it is known that, as a matter of fact, "some" *have, do* or *are.* In all such cases it is permissible to write the proposition as either an ***I*** or an ***O*** proposition, although the *O*-form is preferable even then since it expresses more adequately the negative emphasis of the assertion. For example: "Few people understand the latest theories in physics". Obviously, there are some persons who do understand these theories – their originators; and therefore it is possible to say; "Some people are persons who understand the latest theories in Physics", which is an *I*-proposition. But the intention of the original statement is clearly to emphasize the difficulties involved in understanding modern physical theories and therefore to point out that most people do not understand them; and this fact is best brought out by writing the given proposition as an *O*-proposition: "Some people are not persons who understand the latest theories in physics".

(l) Propositions of the *"all --- are not"* type

For example "All men are not wise". "All is not lost"; "All policemen do not extort money from innocent people". On the face of it, such statements seem to be universal negative propositions. But, if we pay closer attention it would become clear that they are not. The form "all --- are not" may, of course, at times be used in the loose sense as meaning "no … are"; but a stricter interpretation shows that it is really equivalent to "not all are" or "some are not". Example, "All men are not wise". This does not mean that "no men are wise" but only that "not all men are wise" or that "some men are not wise". The reduction form of the proposition must therefore be to an *O*-proposition: "Some men are not wise".

Similar considerations show that "all is not lost" really means "not all is lost", or "some is not lost" – an *O*-proposition. "All policemen do not extort money from innocent people," means "Not all policemen extort money from innocent people" which means "Some policemen are not persons who extort money from innocent people".

(m) Propositions that are extremely awkward in strict form

Numerous statements can be reduced to strict logical form only with the greatest difficulty, and, even when reduced they are extremely awkward in strict form. Examples "It is raining", "it was the night before Christmas"; "it didn't freeze"; "There was no book in the cupboard". It is unarguable that assertions of this type are either true or false; they are therefore genuine propositions and as such ought to be stateable in strict logical form; but the best that can be done is to develop them into linguistic monstrosities such as the following:

"All this case of whether is a case of rain" – *A* proposition

"All that particular night is the night before Christmas" – *A* proposition

"All this particular occasion is one when it didn't freeze" – *A* proposition

"All that occasion is one in which there was no book in the cupboard" – *A* proposition.

It is not always however, that proposition of the type under focus here is translated into *A*- proposition as the above translation would appear to suggest. For example, "There are not red rats" reduces to "No rats are red things"; "There are red rats" reduces to "Some rats are red things".

4.0 Conclusion

In order to minimize errors in evaluating arguments there is a need to develop skills of logical translation to standard form categorical propositions; this is because very often translation into standard (logical) form reveal fallacies prominent among which are the fallacies of equivocation and amphiboly..

5.0 Summary

It is significant to point out that apart from the reason associated with ease in the identification of fallacies, the idea necessitating this reduction is that logic is primarily concerned with the interrelation of meanings, but not with the interrelations of particular meanings. Logic, as it were, is indifferent to specific subject matter; it is primarily concerned with the formal relations between propositions. Logic as such deal with formal properties of propositions, any question concerning the actual truth or falsity of a given proposition can as a matter of fact be disregarded. In fact, what is important in Logic is that the formal properties of the proposition be made explicit by putting the statement into strict logical form, and that propositions be classified according to type.

6.0 Tutor Marked Assignment

Reduce the following propositions into standard form categorical propositions

i. All facts are not disclosed by experimental methods
ii. If it isn't Heineken, it isn't a beer.
iii. An automobile is more expensive than a dozen ice cream cups
iv. Scores of politicians traveled for seminar
v. He jests at score that never felt a wound
vi. A soft answer turneth away wrath
vii. All the cars in the convoy did not a top government official
viii Few people foresaw the dictatorship tendencies of the present president.
ix Nearly every newspaper in the country carried the story.
x Happy indeed is she who know her own limitations
xi. Employment is not an end in itself.
xii. Nothing is worse than self-deception
xiii. No country except in rare circumstances can afford to be either on the giving or the receiving end of a breadline permanently.
xiv. Not all were eye witnesses who reported the accident.
xv All but a few prefer the security of peace.
xvi. Only wise preparation can prevent a great wave of unemployment.
xvii. Few Nigerians at home suffered as did th4 fugitives in Equatorial Guinea.
xviii Amarachi is the sister of Uchechi
xix He sees not his shadow who faces the sun
xx Our staunch belief in freedom and in human dignity alone induces us to oppose the aggressor.
xxi. Many carryover students still failed the examination
xxii. None but a fool behaves like that
xxiii There was a parade.
xxiv The students support no candidate if the ruling party
xxv He prayeth well who loveth well
xxvi Fear is a common emotion
xxvii Whatsoever a man soweth that shall he also reap.
xxviii He loves not God who does not his fellow humans.
xxix A few of the protesting students were rusticated
xxx There is no peace for the wicked.

7.0 References/Further Reading

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Unit 3 Class Interpretation of Categorical Propositions

1.0 **Introduction**

2.0 **Intended Learning Outcomes (ILO's)**

3.0 Main Contents

3.1 Existential Import of Categorical Propositions

1.0 Introduction

This study unit introduces the learner to the class interpretation of categorical propositions. The four standard-form categorical propositions are interpreted as class names, and the propositions themselves shown as asserting either (full or partial) class-inclusion or (full or partial) class-exclusion.

2.0 Intended Learning Outcomes

It is expected that at the end of this unit, you will be able to:

1. Differentiate between generic and general propositions
2. Understand the basic concepts in class logic
3. Understand the meaning of existential import and the difference in what Universal and Particular propositions assert in this respect.
4. Use Venn diagrams, to express categorical propositions in terms of class membership with equations and inequalities.

3.0 Main Contents

3.1 Existential Import of Categorical Propositions

Each of the standard form categorical proposition expresses a certain relationship between two classes of things - the class of things referred to by the subject of the statement and the class of things referred to by the predicate of the statement. Statements are re-written into standard categorical form in order to make clear what the subject and predicate terms are and exactly what relationship is being asserted between them. We have seen that this involves clearly specifying the subject class S, the predicate class P, the quantity of the subject intended (universal or particular) and the copula (affirmative or negative). Thus, the terms of categorical propositions have been interpreted as class names, and the propositions themselves have been understood as asserting either (full or partial) class-inclusion or (full or partial) class-exclusion. In a number of cases this interpretation would seem rather forced and arbitrary and wont to result in awkward statements.

To avoid this, the traditional form of propositions has to be abandoned altogether and recourse has to be taken to a new device for expressing meanings, which cannot be reduced to relations of class - exclusion without a complete distortion of intent. This

modification of the form of propositions is, however, far from sufficient, for it does not allow for the difference in "existential import" of universal and particular propositions.

For example, the two propositions, "All (members of this logic class) are (persons less than twenty years of age)", A, and, "All (roses) are (plants)" A. Both are A propositions, but they are logically not quite on the same level. It is a matter of *empirical fact* (if the proposition is true) that "all members of this logic class" *happen to be* "persons less than twenty years of age". The addition of another member might alter the situation. "Roses," however, are by their very nature "plants," and no matter how many more roses may grow in years to come, they will never be anything but plants. In other words, some universal propositions have a subject term which designates an *empirical collection,* a class whose membership has been completely enumerated. Propositions of this type can be refuted by a single contrary instance. We shall continue to call them *general* propositions.

Other universal propositions have subject terms which do not define empirical collections but which indicate instead something of the *generic nature* of their referents. It is not necessary and, in fact it is often impossible to enumerate all members of the class designated by the subject term. It is, nevertheless, known that *if* anything is a member of the class in question, then it is also whatever the predicate term specifies. Propositions of this type can never be refuted by contrary instances because contrary instances cannot occur. We shall call them *generic* propositions.

Further examples: All horses in this stable are brown" (general); "All horses are mammals" (generic). "All men are mortal" (generic). "All books on this shelf belong to me" (general); "All books are human productions" (generic). "All fish in this basket were caught yesterday" (generic). "All fish are strictly aquatic animals" (general);

All generic propositions are of an essentially hypothetical nature; for what they assert is that "*if* anything is a horse, then it is a mammal"; "*if* anything is a man, then it is mortal"; "*if* anything is a book, then it is a human production"; "*if* anything is a fish, then it is a strictly aquatic animal." This hypothetical nature of generic propositions has found no recognition in the traditional categorical forms. In contemporary logic, however, an appropriate form has been provided. Propositions of this type now take the form, "For all instances or values of x, if x is …, then x is …." – "For all instances or values of x, if x is a rat, then x is a rodent" – ("All rats are rodents") "For all instances or values of x, if x is an insect, then x is not a bird" – ("No insects are birds").

It must be noted that none of these propositions assert that "there *exists* an x which is a horse," or that "there *exists* an x which is a rat"," or that "there *exists* an x which is this or that." They merely state that "*if* such an x exists, then …." Translated into the terminology of traditional logic this means that generic propositions *do not imply* that the

classes designated by their subject terms have members. As a matter of fact, these classes may be null-classes, i.e., classes which cannot possibly have members. If such is the case, the traditional form of categorical propositions again proves inadequate. Null-classes have no place in the Aristotelian system of logic. The new form of writing generic propositions, on the other hand, accommodates them nicely. Example: "All circle-squarers are persons who have accomplished that impossible." If this proposition is interpreted in terms of class-inclusion it leads to discouraging complexities, if not to absurdities; for the predicate term designates a class which, obviously, can have no members (there cannot be any "persons who have accomplished the impossible," for if it has been accomplished, then it was not "impossible," and if it is "impossible," then it cannot have been accomplished). Nevertheless, the A proposition in traditional form asserts that this class which can have no members, includes the class of "circle-squarers"; and this is not exactly a lucid assertion. But when written in the *new* form, the proposition asserts that "For all instances or values of x, if x is a circle-squarer, then x is a person who has accomplished the impossible"; and this is at least a straightforward expression of the real meaning of the original assertion.

Since the new form of writing generic propositions proved to be advantageous in at least two respects – revealing the hypothetical nature of generic propositions, and providing a simple and straightforward expression for propositions involving null classes – it may be helpful to inquire into the possibilities of writing other propositions also in a new form.

Consider, for example, the proposition, "All houses on Udensi Street are dilapidated." This proposition affirms a state of dilapidation of all members of the subject class, but it does not do so generically. Actually the proposition is true if, upon empirical inspection, each and every house on Udensi Street is found to be dilapidated. In other words, the general proposition is only the *sum* of singular judgments ("this house is dilapidated, that house is dilapidated, the other house is dilapidated, .., all of these houses are dilapidated"); and a single exception will falsify it. Furthermore, the dilapidated condition of the houses on Udensi Street may in each case be due to entirely different causes. There is nothing in the conception, "located on Udensi Street, "which implies "being dilapidated," in the same sense in which a rose" implies "being a plant."

Upon further investigation, however, it may be found that the city has developed in such a way that Udensi Street has become the centre of the slum district; that, as a consequence, only the poorest people live there, and that rental conditions offer no inducement to the owners of the tenement houses to repair their property or to build new houses. Since such are the conditions, being "located on Udensi Street" indeed imply

being "dilapidated." The *general* proposition has been transformed into a *generic* proposition.

Consider a second example: "All Justices of the High Courts are those who have been called to the bar". This fact may be established by an investigation of each individual case, past and present. If the given is the result of such an investigation, then it is a *general* proposition. On the other hand, if an examination of it will show being called to the bar is an indispensable prerequisite to becoming a judge; the proposition, All Justices of the High Courts are those who have been called to the bar," is now *generic*.

In the examples given, general propositions have been changed into generic propositions by showing that the members of the subject class can be identified by a *universal law of connection.* What this law is in each particular case only an analysis of the subject class in question can reveal, but whenever a law can be found which transforms a given aggregate of data into a rational context, then a general proposition is changed into a generic proposition. In principle, a law of connection which identifies their members can be found for all universal propositions. These propositions, therefore, can all be regarded as generic, which means that *all of them can be written in the new form:* "For all instances or values of x, if x is …, then x is …." "For all instances or values of x, if x is a member of this particular logic class, then x is less than twenty years of age"; "For all instances or values of x, if x is a small village, then x has no electoral ambitions"; "For all instances or values of x, if x is an epochal period in history, then x permits of radical changes in the political process."

In other words, all universal propositions can be written in such a way as to reveal their *essentially hypothetical* nature, and propositions of this type do not in themselves assert that there exist members of their subject class. They do not entail the existence of such members.

The situation is quite different in the case of the particular propositions, for particulars cannot be interpreted as being hypothetical in nature. "Some nations desire peace"; this, quite obviously, does not mean that "if anything is a nation, then it desires peace," because such an interpretation would change the proposition into a universal. The given particular asserts that, as a *matter of fact,* there exist nations which do desire peace. This assertion may be false, to be sure; but it is the actual meaning of the proposition.

What is true in the respect of an I proposition is also true of an O. Both types of propositions assert something concerning some given members of the subject class. They entail, in other words, the *existence* of some members of the class or, more precisely, they entail an assertion of the existence of such members.

Universal and particular propositions thus *differ in their existential import;* the latter entail an assertion of existence, whereas the former do not.

In order to indicate this difference, contemporary logic writes particular propositions in a form which deviates from the form of the universals in fundamental respects. The new form is this: "There exists an x such that x is … and x is …."; "There exists an x such that x is a pilot and x is twenty year old" – "Some pilots are twenty years old" I. "There exists an x such that x is a dog and x is ferocious" – "Some dogs are ferocious" – I. There exists an x such that x is a nation and x does not respect the Universal Declaration on Human rights" – "Some nations does not respect the Universal Declaration on Human rights" O. "There exists an x such that x is a poem and x is not intelligible" – "Some poems are not intelligible" O.

The following examples illustrate the difference in form between the old and new way of writing propositions.

"For all instances or values of x, if x is a man, then x is a
mortal" – "All (men) are (mortal)" A.

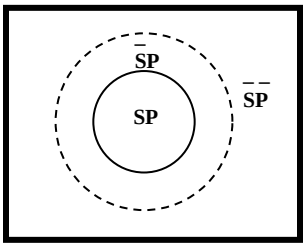
"For all instances or values of x, if x is a sadist, then x is not a moralist" – "No (sadists) are (moralists)" E.

"There exists an x such that x is a flower and x is fragrant" – "Some (flowers) are (fragrant)" I.

"There exists an x such that x is a rose and x is not red" – "Some (roses) are not (red)" O.

Schematic Interpretation The difference in the existential import of universals and particulars can be made evident by means of schematic drawings.

Consider, for example, an A proposition: "All S is P": "All (men) are (mammals).



A: S $\bar{P}$ = 0

Let the rectangle in the diagram above represent the universe of discourse – which in this case is "beings"; it represents, in other words, the general field within which the given proposition is to be used and is to have meaning. The solid circle represents the

denotation of the subject class – "men," and the broken circle represents the denotation of the predicate class – "mortal." Let the letters, S P, S P, S P and S P designate classes composed of members (if any) which are characterized by S (subject term), P (predicate term), and their negatives, S and P.

It will then be observed that in the given universe of discourse there appears a class whose members (if any exist) are characterized by S and P, i.e., a class whose members are both "men" and "mortality"; but the proposition itself does not assert that members of this class exist. Its import is simply that *if* anything is a "man," then it is "mortal".

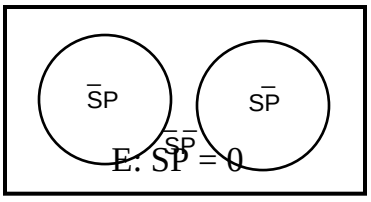
In the universe of discourse there exists also a class S P, whose members (if any) are "not men" but are "mortal." Again the proposition does not say whether or not members or this class exist.

Lastly, there is present in the universe of discourse a class S P, i.e., a class of "beings" which are neither "men" nor "mortal." Again no information is given as to the existence or non-existence of members of this class, but the class itself is at least present in the universe of discourse.

The class S P. i.e. "men' which are "not mortal," on the other hand, does not appear in the universe of discourse. It is *non-existent* for the given proposition in the specified universe of discourse and can therefore have no members within that universe. It is a *null-class.*

This denial of the existence of members of the class SP is in reality the full and complete meaning of the A proposition. The true meaning of an A proposition can therefore be written as "SP is a null-class," or, briefly, as "S P = 0" (See diagram above). Consider next the case of an E proposition: "No S is P" "No (sadists) are (moralists)."

This proposition also can be represented by a drawing:



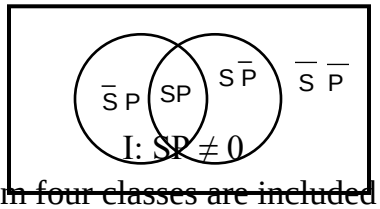
In this drawing there appear (1) a class S P ("non-sadists" who are "moralists"), (2) a class S P ("sadists" who are "non-moralists"); (3) a class S P ("non-sadists" and "non-moralists").

The class S P, i.e., the class of "sadists" who are "moralists," is excluded from the given universe of discourse. As far as the present proposition in this universe is concerned, the class SP is therefore a *null-class;* and the assertion that SP is a null-class is the true and complete meaning of the E proposition because that proposition tells

nothing about the existence or non-existence of members of the classes SP, SP, and SP, but it explicitly denies the existence of members of the class SP. The meaning of an E proposition can therefore be symbolized by writing: "SP is a null-class," or: "SP = 0"

Consider the next case of an 1 proposition: "Some S is P": "Some (girls) are (beautiful)."

If this proposition is represented within the universe of discourse, "living creatures," the following figure is obtained:



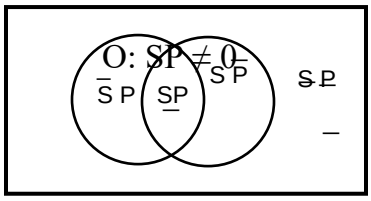
In this diagram four classes are included in the rectangle namely,

1. S P (the class of "girls" who are "not beautiful");
2. S P (the class of "beautiful living creatures" that are "non-girls");
3. S P (the class of "living creatures" that are neither "girls" nor "beautiful"); and
4. SP (the class of "girls" who are "beautiful").

Although nothing is learned about the existence or non-existence of members of the classes S P, S P, and S P, the I proposition specifically asserts that in this universe of discourse there exist a class S P. SP, therefore, does *not* designate a null-class: "SP ≠ 0".

Consider, finally, the case of an O proposition: "Some S is not P": "Some (buses) are not (suitable for inter-campus shuttle)."

The O proposition is represented in the following figure:



The class S P, which may or may not have members, consist of "buses" which are "suitable for inter-campus shuttle." The class S P comprises all "means of transportation suitable for inter-campus shuttle" which are "non-buses"; but there is nothing in the diagram to indicate whether or not this class has members. The class S P, i.e., the class of "means of transportation" which are "non-buses" and which are "not suitable for inter-campus shuttle," is also left indefinite as to the existence or non-existence of members. But concerning the class S P, i.e., concerning the class of "buses" which are "not suitable for inter-campus," the given proposition definitely asserts that it is not a null-class, for

null-classes are excluded from the universe of discourse, but the class S P is specifically included in that universe: "S P ≠ 0".

When the diagrammatic representatives of the ***A***, ***E***, ***I*** and ***O*** propositions are compared, it will be found to be characteristic of A and E propositions that they assert that certain classes are null-classes; whereas it is just as characteristic of I and O propositions that they assert that certain classes are not null-classes. This difference in what the two types of proposition assert is in all essentials the difference in their existential import terms of class concepts.

Schematically:

A: S P = 0 **E: S P = 0**

I: S P ≠ 0 **O: S P ≠ 0**

3.2 Venn diagram interpretation of Standard-form Categorical Propositions

A somewhat different schematic representation of categorical propositions, although employing essentially the same symbolism, was first used by the nineteenth-century logician John Venn. His schematisms are known as the Venn diagrams.

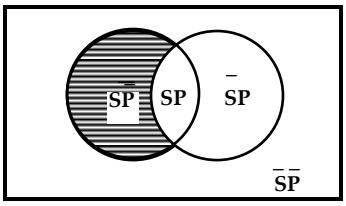
We use the same letter symbols as before. That is to say, we again interpret the subject term and the predicate term of a proposition as classes. As before, let the letter S stand for that which characterizes the class of the subject term; and let $\overline{S}$ be the negative of S. Again as before, let the letter P stand for that which characterizes the class of the predicate term; and let $\overline{P}$ be the negative of P. Let the symbol ≠ be the negative of =; and let 0 signify an empty class.

We can then represent combinations of classes and, therefore, propositions of the categorical kind by combining the symbols. To begin with, we discover that there are four and only four ways in which the letter symbols can be combined in pairs:

	Classes	Symbols
1.	Flowers that are roses and are red	$S\overline{P}$
2.	Flowers that are roses but are not red	SP
3.	Flowers that are not roses but are red	$\overline{S}\overline{P}$
4.	Flowers that are not roses and are not red	$\overline{S}\,\overline{P}$

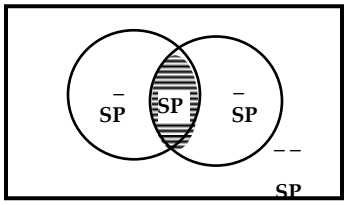
By means of only two overlapping circles drawn in a rectangle (which represents the universe of discourse) we can now represent the traditional categorical propositions. Only two additional stipulations are required, namely, that a shaded area represents a class which has no members; and that an **x** in an area means that the class represented by that area has at least one member.

The A proposition, "All Roses are red," obviously asserts that all members of the class S are also members of the class P, and that therefore the class $S\bar{P}$ is empty. The Venn diagram indicates this as follows:



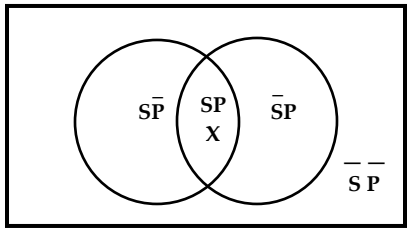
A: $S\bar{P} = 0$

The E proposition, "No Roses are red," asserts that no members of the class S are also members of class P, or that SP is empty. The Venn diagram, therefore, shows:



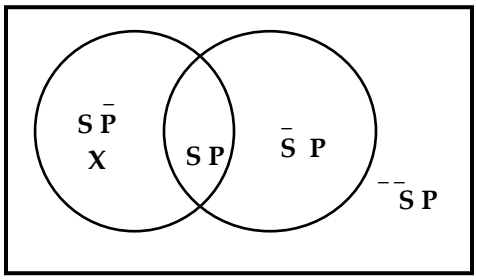
E : SP = 0

The I proposition, "Some Roses are red," asserts that at least one member of the class S is also a member of the class P. That is to say, the class SP is not empty. Hence, the diagram:



I: $SP \neq 0$

The O proposition, "Some Roses are not red," asserts that at least one member of the class S is also a member of the class P. That is, the class SP is not empty. Schematically:



O: $S\bar{P} \neq 0$

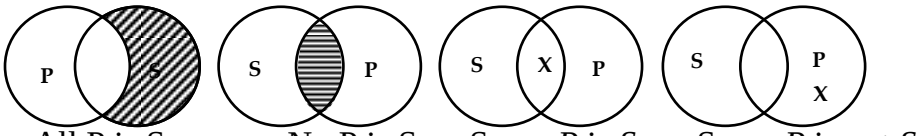
We thus have the following equivalent formulations:

Traditional		Venn	
A:	All S is P	A:	$S\bar{P} = 0$
E:	No S is P	E:	$SP = 0$
I:	Some S is P	I:	$SP \neq 0$
O:	Some S is not P	O:	$S\bar{P} \neq 0$

One aspect of these Venn diagrams must be emphasized. The bare two-circle diagram, labeled but not otherwise marked, represents classes but diagrams no proposition. That a space is left blank signifies nothing – neither that there are, nor that there are not, members of the class represented by that space. Propositions are diagrammed only by those diagrams in which a part has been shaded out or in which an **x** has been inserted.

We have constructed diagrammatic representations for "No S is P" and "Some S is P", and since these are logically equivalent to their converses "No P is S" and "Some P is S", the diagrams for the latter have already been shown. To diagram the ***A*** proposition "All P is S", symbolized as $P\bar{S} = 0$, within the same framework we must shade out the part of the diagram that represents the class $P\bar{S}$. It should be obvious that the class $P\bar{S}$ is the same as the class $\bar{S}P$, if not immediately then by recognizing that every object that belongs to the class of all professionals and the class of all students must (also) belong to the class of all students and the class of all professionals – all professionals who are non-

students and non-students professionals, and vice versa. And to diagram the ***O*** proposition "Some P is not S" symbolized by P S $\neq 0$, we insert an x into part of the diagram that represents the class P S (= S P). Diagrams for these propositions then appear as shown below:



All P is S — $P\,\bar{S} = 0$

No P is S — $PS = 0$

Some $\underline{P}$ is S — $PS \neq 0$

Some P is not S — $P\,\underline{S} \neq 0$

This further adequacy of the two-circle diagrams is mentioned because in the following section it will be important to be able to use a given pair of overlapping circles with given labels – say, S and M – to diagram any standard-form categorical proposition containing S and M as its terms, regardless of the order in which they occur in it.

It is notable also that the Venn diagrams give an *iconic* representation of the standard-form categorical propositions, in which spatial inclusions and exclusions correspond to the non-spatial inclusions and exclusions of classes. They not only provide an exceptionally clear method of notation but are also the basis of the simplest and most direct method of testing the validity of categorical syllogisms.

4.0 Conclusion

In the Aristotelian tradition, the subject term of a universal proposition is assumed implicitly to be existential in the sense that the class denoted by the subject term has members. However, the invention of the diagrammatic method popularly known as the "Venn Diagrams" have facilitated the interpretation of universal propositions as non-existential in the sense of not implying the existence of members of the class denoted by the subject term. Using overlapping regions of the Venn diagrams to illustrate relations between classes or the relations of the truth-conditions of propositions, the method first represents all possible combinations of classes by distinct areas of the diagram. Next it indicates by marks which combinations are empty and which are not, for the meaning of a given proposition. The traditional A proposition, for example, "All S is P," is to be interpreted to mean that there is no such class of things in existence as "S that is not-P" and is diagrammed as S P = 0. From this illustration, the proposition "All S is P" is interpreted as the denial of the existence of a certain class, that is, S P XY or "S that is not-P",

5.0 Summary

Modern understanding of categorical propositions requires its interpretation as asserting a relation of inclusion or exclusion, complete or partial, between two classes. Thus, we have four possible class relations in the various kinds of categorical propositions: complete inclusion, e.g. "All philosophers are great thinkers"; .complete exclusion, e.g. "No philosophers are great thinkers"; partial inclusion, e.g. "Some philosophers are great thinkers; partial exclusion, e.g. "Some philosophers are not.

Venn introduced the diagrams that bear his name as a means of representing these relations of inclusion and exclusion between classes, or sets. Two-circle Venn diagrams are used to represent categorical propositions, whose logical relations were first studied systematically by in traditional logic. The A-proposition "All S are P," is represented by shading the part of the circle labeled S that does not intersect the circle labeled P, indicating that there is nothing that is an S that is not also a P. E-proposition, "No S are P," is represented by shading the intersection of S and P; I-proposition "Some S are P," is represented by placing an *x* in the intersection of S and P; and O-proposition "Some S are not P, is represented by placing an *x* in the part of S that does not intersect P.

6.0 Tutor Marked Assignment

1. What is meant by existential import?
2. Outline the difference between "general" and generic propositions.
3. Identify which of the following propositions are general propositions
   i. All charge and bail lawyers are assessed unsuccessful
   ii. All people who failed the examination did not write the quiz.
   iii. All men are mortal.
   iv. No judges are laymen.
   v. All carryover students are mediocres
4. Change the following propositions into the new form of categoricals.
   i. Some Governors abandoned the party's programme of action.
   ii. All intellectuals are opposed to cutting corners
   iii. Some witnesses cannot be believed
   iv Many persons who love classical music do not care a hoot about Afrobeat.
   v. No man of honour throws mud
   vi. Not all die-hard lovers of the national team are recognized fans.
   vii. All fathers are entitled to respect and support from their wards who knew what good upbringing is.
   viii. Some persons do not understand why fools often win elections.
   ix. A proper degree of competition will ensure the best service at the lowest cost.

x. Some African footballers of the year winners are not fit to play in competitive tournaments.

5. Put the following propositions into traditional form
   i. For instances or values of x, if x is a nation, then x is entitled to freedom from outside interference in its internal affairs.
   ii. There exists an x such that x is a president of a country and x is corrupt.
   iii. For all instances or values of x, if x is a student in Ebonyi State University, then x cannot avoid tal rigours and deprivation of non-residential studentship.
   iv. There exists an x such that x is a lawyer and x is not involved in charge and bail.
   v. There exists an x such that x is not a lawyer and x is involved in charge and bail.
   vi. For all instances or values of x, if x is not a spider, then x does not have eight legs.
   vii. For all instances or values of x, if x is a banana, then is not an apple.
   viii. There exists an x such that x is neither a regular student nor a part time student and x is an acclaimed student of this university.
   ix. For all instance or values of x, if x is not a lawyer, then x is not entitled to right of self defence.
   x. There exists an x such that x is a philosopher and x is not an atheist.

6. Using the Venn diagrams, name the type of categorical proposition which each of the following propositions is and express it in terms of class membership with equations and inequalities.
   i. Some registered students are not intellectually capable.
   ii. No present Governors are truly democratically elected.
   iii. Some liars are hardworking
   iv. All interns who reject their postings are unaware of the negative effect of insubordination.
   v. Some stockbrokers who advise their customers about making investments are not partners in companies whose securities they recommend.
   vi. All medieval scholars were pious monks living in monasteries.
   vii. No good scholars are “layouts”.
   viii. Some logicians are not mathematically minded
   ix. No pipelines laid across the major highways are safe.
   x. Some home videos are not to be shown during peak hours.

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Module 4 Categorical Inferences

Unit 1 Immediate Inference: Logical Relation of Equivalence
Unit 2 Immediate Inference: Logical Relation of Opposition
Unit 3 Immediate Inference by Converse Relation

Unit 1 Immediate Inference

3.0 Introduction
4.0 Intended Learning Outcomes (ILO's)
3.0 Main Contents
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- **3.2 Conversion**
- **3. 3 Obversion**
- **3.4 Other Combinations of Conversion and Obversion**
  - **3.4.1 Obverted Converse**
  - **3.4.2 Contraposition**
  - **3.4.3 Inversion**

4.0 Conclusion
5.0 Summary
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3.0 Introduction

This study unit introduces the learner to the type of inference made in categorical logic. It draws attention to the relation of equivalence between the categorical propositions, that is, how each of the categorical propositions can take the place of the other without changing the context within which the substitution is made. It is this

relation of equivalence that provides the basis and justification for what is known as *immediate inference.*

4.0 Intended Learning Outcomes

It is expected that at the end of this unit, the learner will be able to:

1. Valid make immediate inferences from any of the categorical propositions by purely transformation of the proposition
2. understanding the logical relationships between categorical propositions with the same subject and predicate
3. Determine the truth or falsity the corresponding categorical propositions from the truth or falsity of one them
4. Understand how correct reasoning proceeds from one categorical proposition to another.

3.0 Main Content

3.1 Immediate Inference

Inference ordinarily is a process that allows the establishment of a certain proposition (the conclusion) from other set(s) of propositions (the premisses) which constitute the evidence for the establishment of the former. This means that inference is the derivation, on *strictly logical grounds*, of specific propositions or "conclusions" from given propositions or "premisses". Ordinarily several premisses are required to establish a conclusion. When only one proposition is used as premiss, and when the conclusion is derived by a purely verbal transformation of this proposition, then the process is called *immediate inference.* "No dogs are six-legged animals; therefore, no six-legged animals are dogs"; "All persons who were admitted had been invited; therefore, no person who was not invited was admitted".

The derived propositions may be so obviously entailed by the "premisses" that the inference itself, the transition from "premiss" to "conclusion", seems trivial. Nevertheless, the verbal transformation of the "given" proposition or premiss leads in each case to a proposition which is different from the original and which therefore is "new" in a logically significant sense, while at the same time it retains the truth-value of the original.

Traditionally, two forms of transformation have been accepted as the basis of immediate inference; namely *Conversion* and *Obversion.*

3. 2 Conversion

Conversion is ordinarily the simplest kind of *eduction*. It is accomplished simply by interchanging or switching the subject term and the predicate term of a proposition in such a manner that the original subject term becomes predicate term, while the original predicate term becomes subject term of the new proposition. The quality of the

proposition remains unchanged. If it is affirmative, it remains affirmative; and if it is negative, it remains negative.

The original proposition or premiss is called the *convertend.* The proposition which is inferred is called the *converse.*

The conversion of *E* and *I* propositions involves nothing but the interchange of the terms: interchanging the subject and predicate terms of a categorical proposition (it is valid, or preserves the truth value) for the **E** and **I** propositions only)

Convertend: No (Labour leaders) are (advocates of deregulation)	*E*
Convese: No (advocates of deregulation) are (Labour leaders)	*E*
Convertend: Some (police officers) are (corrupt)	*I*
Converse: Some (corrupt persons) are (police officers)	*I*

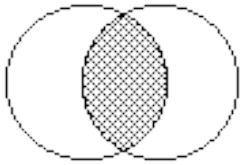
The reason for such *simple* conversion may be seen in the fact that in *E* and *I*-propositions subject term and predicate term have the same distribution. In *E* propositions both are distributed, and in *I* propositions both are undistributed; that is, the truth value is preserved for those statements with symmetrical distribution status: the **E** and **I**. To say, for example, that "No Labour leaders are advocates of deregulation", is to say that all members of the class of "Labour leaders" are excluded from the class "advocates of deregulation"; the two classes have no members in common. The same idea is expressed by the proposition, "No advocates of deregulation are Labour leaders," for his proposition asserts that all member of the class of "advocates of deregulation" are excluded from the class of "Labour leaders".

Whenever such complete exclusion is asserted, it makes no difference of which class it is said that it excludes the other, for the exclusion is mutual. The interchange of the terms, therefore, in no way affects the meaning of the proposition. An *E* proposition asserts that no member of the subject class, S, is at the same time a member of the predicate class, P; but to assert this is the same as to assert that no member of the class P is at the same time a member of the class S. Therefore, in generalized schematic form, No S is P ≡ No P is S, where "≡" signifies equivalence.

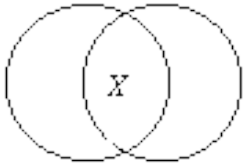
In the case of *I* propositions, the assertion is made that some of the members of one class are also members of some other class, and this identity of some members of the two classes is unaffected by the order in which these classes are mentioned in the proposition. To say that "Some police officers" are identical with "Some corrupt persons" is in all essentials the same as to say that "Some corrupt persons" are identical with "Some police officers", for identity is a *symmetrical relation*, that is, a relation

which is such that if one thing bears it to a second, the second bear it also to that first. In generalized schematic form: Some S is P ≡ Some P is S.

E and *I* propositions, therefore, can be converted without further change or manipulation of the respective convertends. They can be converted by *simple* conversion. Another way to remember that only the **E** and **I**statements preserve the truth value in conversion is to note that flipping the **E** and **I** Venn Diagrams over results in the same logical geography being displayed. *I.e*., their diagrams are symmetrical respectively



E



I

In the case of an *A* proposition an additional circumstance must be considered, for in an *A* proposition subject term and predicate term do not possess equal distribution. The subject term of an *A* proposition, being the subject term of a universal, is *distributed;* but the predicate term of an *A* proposition, being the predicate term of an affirmative, is *undistributed.* Some conversion of an *A*- proposition would therefore mean that an undistributed term serving as predicate of the convertend would have to be distributed when it occupies the place of the subject in the converse. Such an expansion of the meaning of a term is not permissible since it would carry with it a denotation, which is not warranted by the undistributed use of the term. Although "all roses are plants", it is not true that "all plants are roses"; for the meaning of "all roses are plants" is actually "all roses are some of the plants", and this meaning must be preserved in the process of conversion. Therefore, if an A proposition is converted, it must be *changed in quantity* to conform to the distribution of the logical predicate term.

Convertend:	All (philosophers) are (great thinkers)	*A*
Converse:	Some (great thinkers) are (philosophers)	*I*

In schematized form: All S is P ≡ Some P is S. The A proposition must be *converted by limitation*. Its converse is an *I*.

This means, however, that the equivalence of an *A* proposition and its converse *I* is not complete or perfect. The truth of the *A* entails the truth of the *I*; but the falsity of the *A* does not necessarily entail falsity of the *I*. Conversely, the falsity of the *I* entails the falsity of the *A*; but the truth of the *I* does not necessarily entail the truth of the *A*. We are here confronted with a partial equivalence only. But even this partial equivalence is logically significant.

In a few special cases the predicate term of an *A* proposition has, *as a matter of fact,* the same distribution as has the subject term. Example, "All (equiangular triangles) are (equilateral triangles)" *A*. In this case it is known from the nature of Euclidean geometry that the class of "equilateral triangles" is equal in extension to the class of "equiangular triangles". Both S and P, therefore, have the same distribution, and the proposition, "All (equiangular triangles) are (equilateral triangles)", can be converted by simple conversion. This simple conversion of an *A*- proposition is permissible because of evidence which transcends the logical form of the proposition itself. It is not warranted on logical grounds alone, and therefore, strictly speaking, it is not immediate inference, i.e., it is not an inference which presupposes nothing but the given convertend. Whenever conversion *on purely logical grounds* is demanded, all *A* propositions must be converted by *limitation.*

An *O* proposition, finally, cannot be converted at all; for any attempt at conversion leads at once to the use of an originally undistributed subject term as a distributed predicate term, and this change from the undistributed use to the distributed use of term is logically impossible. What is true of "some" members of a class need not be true of "all" members of that class. Since there is no way of getting around the unjustifiable change in distribution encountered in the attempted conversion of an *O* proposition *no converse can be derived from an O.*

The complete inference table for **conversion** is as follows

If "All **S** is **P**" is true, then "All **P** is **S**" is undetermined

If "All **S** is **P**" is false, then "All **P** is **S**" is undetermined.

If "No **S** is **P**" is true, then "No **P** is **S**" is true

If "No **S** is **P**" is false, then "No **P** is **S**" is false

If "Some **S** is **P**" is true, then "Some **P** is **S**" is true

If "Some **S** is **P**" is false, then "Some **P** is **S** is false

If "Some **S** is not **P**" is true, then "Some **P** is not **S**" is undetermined.

If "Some **S** is not **P**" is false, then "Some **P** is not **S**" is undetermined.

3. 3 Obversion

The second type of transformation of propositions involved in immediate inference called eduction is known as *obversion.* In this process the subject and predicate terms do not change places, but the quality of the proposition is modified. Actually, two steps are involved. Firstly, the quality of the proposition as a whole is changed to its opposite. If the *obvertend* is affirmative, the *obverse* is negative:

All (. . .) are (. . .) *A*,
becomes
No (. . .) are (. . .) *E*

Some (. . .) are (. . .) *I*,
becomes
Some (. . .) are not (. . .) *O*

If the obvertend is negative, the obverse is affirmative:

No (. . .) are (. . .) *E*,
becomes
All (. . .) are (. . .) *A*,
Some (. . .) are not (. . .) *O*,
becomes
Some (. . .) are (. . .) *I*.

The second step in obversion involves the predicate term, for this term must be changed to its logical contradictory. A positive predicate term is made negative, and a negative predicate term is made positive.

Obvertend: All (good scholars) are (persuasive) *A*
Obverse: No (good scholars) are (non-persuasive) *E*

Obvertend: Some (facts) are not (facts that have been proved) O
Obverse: Some (facts) are (facts that have not been proved) *I*

All four types of categorical propositions can be obverted. The *A* proposition becomes an *E*; the *E* becomes an *A*. The *I*-proposition becomes an *O*; and the *O* becomes an *I*. It is important, however, not to forget the modification of the predicate term.

If the predicate term of the obvertend is negative, the change is made in conformity with the general principle that a double negation is equivalent to an affirmation, thus:

Obvertend: No (humans) are (non-mortals) *E*

Obverse: All (humans) are (non non-mortals) i.e. they are (mortals) *A*.

If the predicate term consists of a phrase rather than of a single word, it is extremely important to place the negation in its logically proper place. The obverse of "Some (labour unions) are (controlled by men who have strong Marxist leanings)" *I*, is not "Some (labour unions) are not (non-controlled by men who have strong Marxist leanings)" *O*, nor is it "Some (labour unions) are not (controlled by non-men who have strong Marxist leanings)" *O*; it is "Some (labour unions) are not (controlled by men who do not have strong Marxist leanings)" *O*. The negation inserted in the predicate must negate the logically essential part.

Obvertend: All (spiders) are (animals having eight legs) *A*

Obverse: Not: No (spiders) are (non-animals having eight legs) *E*

But: No (spiders) are (animals not having eight legs) *E*

A distinction is normally made between "infinite terms" (such as "non-moral", "non-logical", non-social"), and negative adjectives and substantives which have a positive meaning (such as "unjust, untrustworthy," "immorality", and "immoderateness"). This distinction is important for the process of logical obversion. If the obvertend is "No (passions) are (moral)" *E*, then it is one thing to infer that "All (passions) are (immoral)" *A*, and it is something entirely different to infer that "All (passions) are (non-moral)"*A*. Only the latter can be regarded as the true logical obverse of the original, for only the term "non-moral", including as it does the meaning of "morally indifferent" as well as of "immoral", is the complete negation of the term "moral".

What is true of the term "non-moral" is true of all "infinite terms"; they, and not the grammatically negative terms with a positive meaning, are the logical contradictories of their respective positive terms.

The complete inference table for **obversion** is as follows:

If "All **S** is **P**" is given true, then "No **S** is non-**P**" is true.

If "All **S** is **P**" is given false, then "No **S** is non-**P**" is false

If "No **S** is **P**" is given true, then "All **S** in non-**P**" is true

If "No **S** is **P**" is given false, then "All **S** is non-**P**" is false

If "Some **S** is **P**" is given true, then "Some **S** is not non-**P**" is true.

If "Some **S** is **P**" is given false, then "Some **S** is not non-**P**" is false

If "Some **S** is not P" is given true, then "Some **S** is non-**P**" is true

If "Some **S** is not P" is given false, then "Some **S** is non-**P**" is false.

3. 4 Other Combinations of Conversion and Obversion

When the two basic forms of immediate inference, *conversion* and *obversion*, are combined in certain specific ways, other and more complex types of immediate inference are obtained but no new principles of logical procedure are required. The transformations discussed so far suffice for all of these inferences.

3.4.1 Obverted Converse – When a given proposition is converted and when the converse is thereupon obverted, the resultant is known as the *obverted converse.*

Original: All (philosophers) are (great thinkers) *A*
Converse: Some (great thinkers) are (philosophers) *I*
Obverted Converse: Some (great thinkers) are not (non-philosophers) *O*

Original: No (reactionaries) are (advocates of progressive reforms) *E*
Converse: No (advocates of progressive reforms) are (reactionaries) *E*
Obverted Converse: All (advocates of progressive *reforms*) are (non-reactionaries)
A

Original: Some (sound scholars) are (good teachers) *I*
Converse: Some (good teachers) are (sound scholars) *I*
Obverted Converse: Some (good teachers) are not (non-sound scholars) *O*.

Since an *O* proposition cannot be converted, it yields no obverted converse.

When the examples of obverted converses given above are examined, it will be seen that in each case the original predicate has become the subject, while the negative of the original subject has become the predicate. This change and interchange of terms is characteristic of every obverted converse.

If "All **S** is **P**" is true, then "Some P is not non-**S**" is true
If "All **S** is **P**" is false, then "Some P is non-**S**" is undetermined.
If "No **S** is P" is true, then "All **P** is non-S" is true
If "No **S** is **P**" is given false, then "No non-**P** is non-**S**" is undetermined
If "Some **S** is **P**" is given true, then "Some non-**P** is non-**S**" is undetermined.
If "Some **S** is **P**" is given false, then "Some non-**P** is non-**S**" is u
If "Some **S** is not **P**" is given true, then "Some non-**P** is not non-**S**" is true. undetermined.
If "Some **S** is not **P**" is given false, then "Some non-**P** is not non-**S**" is false.

3.4.2 Contraposition – When a given proposition is first obverted and then converted, the resultant is known as *partial contrapositive*. When this new proposition is obverted, the result is known as the *full contrapositive.*

Original: All (sound students) are (hardworking) *A*
Obverse: No (sound students) are (non- hardworking) *E*
Partial Contrapositve: No (non-hardworking persons) are (sound students) *E*
Full Contrapositive: All (non-hardworking persons) are (non-sound students) *A*

Original: No (sound lawyers) are (attorneys notable for charge and bail) *E*
Obverse: All (sound lawyers) are (attorneys not notable for charge and bail) *A*
Partial Contrapositive: Some (attorneys not notable for charge and bail) are (sound lawyers) *I*
Full Contrapositive: Some (attorneys not notable for charge and bail) are not (non-sound lawyers) *O*

Original: Some (beautiful girls) are not (promiscuous) *O*
Obverse: Some (beautiful girls) are (non-promiscuous) *I*
Partial Contrapositive: Some (non promiscuous girls) are (beautiful)*1*
Full Contrapositive: Some (non-promiscuous girls) are not (non-beautiful) *O*

No contrapositive can be derived from an original *I* proposition because the second step in the transformation requires the conversion of the obverse, and the obverse of an *I* proposition is an *O*, which cannot be converted.

It is characteristic of all full contrapositives that their subject term is the negative of the original predicate, while their predicate term is the negative of the original subject. The quality of the full contrapositive is the same as that of the original. The quantity is the same in the case of an original *A* or an original *O*; but in the case of an original *E*, the quantity is reduced, and the *E* becomes an *O*.

The inference table for all the **contrapositives** is as follows:

If "All **S** is **P**" is given true, then "All non-**P** is non-**S**" is true
If "All **S** is **P**" is given false, then "All non-**P** is non-**S**" is false.
If "No **S** is P" is given true, then "No non-**P** is non-S" is undetermined

If "No **S** is **P**" is given false, then "No non-**P** is non-**S**" is undetermined

If "Some **S** is **P**" is given true, then "Some non-**P** is non-**S**" is undetermined.

If "Some **S** is **P**" is given false, then "Some non-**P** is non-**S**" If "Some **S** is not **P**" is given true, then "Some non-**P** is not non-**S**" is true. undetermined.

If "Some **S** is not **P**" is given false, then "Some non-**P** is not non-**S**" is false.

3.4.3 Inversion: When the original proposition is either an *A* or an *E* a type of transformation is possible which is known as *inversion.* In the case of an *A* proposition the *full inverse* is derived from the full contrapositive by an additional conversion; and when the full inverse is obverted, the resultant is the *partial inverse.*

Original: All (litigants) are (stereotypes) *A*

Obverse: No (litigants) are (non-stereotypes) *E*

Partial Contrapositive: No (non-stereotypes) are (litigants) *E*

Full Contrapositive: All (non-stereotypes) are (non-litigants) *A*

Full Inverse: Some (non-litigants) are (non-stereotypes) *I*

Partial Inverse: Some (non-litigants) are not (stereotypes) *O*

In the case of an original E proposition, the *full inverse* is derived by converting the obverted converse, and then obverting again.

Original: No (defenders of deregulation) are (people-oriented leaders) *E*

Converse: No (people oriented leaders) are (defenders of deregulation) *E*

Obverted Converse: All (people oriented leaders) are (leaders who are not defenders of regulation) *A*

Partial Inverse: Some (leaders who are not defenders of deregulation are people-oriented leaders)

I

Full Inverse: Some (leaders who are not defenders of deregulation) are not non-people oriented leaders) *O*

The distinctive feature of the full inverse is that its subject term is the negative of the original subject, and its predicate term is the negative of the original predicate. The quality of the full inverse is the same as that of the original. The quantity, however, has been reduced: the *A* has become an *I*, and the *E* has become an *O*.

The results obtained through the transformation of given propositions by means of obversion and conversion are summarized in the following table of immediate inferences:

	A	**E**	**I**	**O**
Original	All S is P	No S is P	Some S is P	Some S is not P

Converse	Some S is P	No P is S	Some P is S	None
Obverse	No S is non-P	All S is non-P	Some S is not non- P	Some S is non P
Obverted Converse	Some P is not non-S	All P is non-S	Some P is not non- S	None
Partial Contrapositive	No non-P is S	Some non-P is S	None	Some non P is S
Full Contrapositive	All non-P is non-S	Some non-P is not non-S	None	Some non-P is not non-S
Partial Inverse	Some non-S is not P	Some non-S is P	None	None
Full Inverse	Some non-S is non-P	Some non S is not non-P	None	None

4.0 Conclusion

Immediate inference, deals with inferences of such a type that the conclusion is derived from a single premiss (proposition) and (in most cases) merely a re-statement in different but equivalent form of that premiss (original proposition}.

5.0 Summary

This unit explained the type of immediate inference, generally called eduction. Eduction involves the act of drawing out the implied meaning of a given proposition. Although conversion and obversion are the two principal methods in eduction the results obtained through the transformation of given propositions by means of obversion and conversion gives us five (5) other types of eduction, namely, Obverted Converse, Partial Contraposition, Full Contraposition, Partial Inverse and Full Inverse, thus making seven types of eduction..

6.0 Tutor Marked Assignment

1. Put each of the following propositions into strict logical form. Whenever possible, give (a) the Converse, and (b) the Obverse.

i. Not all moral values are religious values
ii. Some men do not die young.
iii. A few politicians have placed their personal ambition above the nation's interest.
iv. Any segment of the sprawling Federal Capital Territory lacks the definitive past which would give it a local culture of special mark.
v. People were laughing in the streets.
vi. Some people see spiritual meanings in material things.
vii. A man's work reveals his character.
viii. Only the profiteers were unpopular.

ix. Improvements in communications have rendered the world smaller.
x. The people are the foundation of the state.
xi. Few people realize how much sickness flows from an inadequate diet.
xii. No affection of cultural interests can conceal a commonplace mind.
xiii. Most things have their price.
xiv. Few will deny that mankind has progressed.
xv. Nothing is more marvelous than the everyday facts of life.
xvi. A few facts have been established beyond all doubt.
xvii. Nothing but avarice could move him.
xviii. He never loved who loved not at first sight.
xix. Every soldier is not a hero.
xx We cannot escape history.

2. Put each of the following propositions into strict logical form. Whenever possible give (a) the Obverted Converse, and (b) the full Contra-positive.

i. The problems of peace are of the nature of man.
ii. Some politicians have lost the support of the people.
iii. Our musical culture has not kept pace with our enthusiasm.
iv. Few will deny his greatness.
v. Love is never quite devoid of sentimentality.
vi. No champion of democracy can accept beliefs which do not imply personal freedom.
vii. All efforts to establish peace which are not based upon justice for all are predestined to failure.
viii. The only valid approach to music is through music
ix. Without continuing renewal, no art form can endure.
x. Some men die young.

3. Put each of the following propositions into strict logical form. If the proposition is an A, derive the Partial Inverse; if it is an E, derive the Full Inverse.

i. A mechanistic conception of human life ends in despair.
ii. Peace does not come where starvation stays.
iii. Only careful planning can prevent an economic catastrophe.
iv. Scarcity of food is the root of many troubles in the world.
v. He is indifferent to money.
vi. No man can live on a star.
vii. Each work of art possesses unique formal properties.

viii. Only at the outset did the observers experience any difficulties with the telescope.

ix. Intelligence manifests itself in a variety of ways.

x. No logical arguments prove the existence of God.

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Unit 2. Immediate Inference: Logical Relation of Opposition

1.0 Introduction

This study unit introduces the learner to an important tool in understanding the logical relationships between categorical propositions with the same subject and predicate. Called the traditional square of opposition, this tool provides a basis for the kind of immediate inference where each of the four categorical propositions can serve as

a premiss for immediate inference. Thus, if an A proposition is used as a premiss, then one can immediately infer that the corresponding O proposition (having the same subject and predicate terms as the A) is false.

2.0 Intended Learning Outcomes

It is expected that at the end of this unit, the learner will be able to:

1. Gain greater insight into the process of inference and the logical relations between the four categorical propositions.
2. Infer the truth value of each of the categorical propositions based upon the truth values of other propositions with the same terms
3. Understand the logical significance of transforming a given assertion into one or more of its equivalent forms.

3.0 Main Content

3.1 The Opposition of Propositions

Generally, when we talk of the theory of opposition, we are talking of the relationships that can arise with propositions differing or sharing in quantity and quality. In this context, we have the following instances:

Case 1: propositions that differ in quantity and quality.

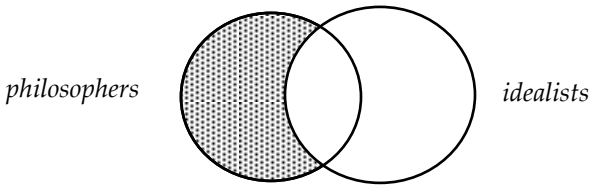
Case 2: propositions that differ in quality but are the same in quantity.

Case 3: propositions that differ in quantity but not the quality

Case 4: propositions that have the same quantity and quality (the trivial case).

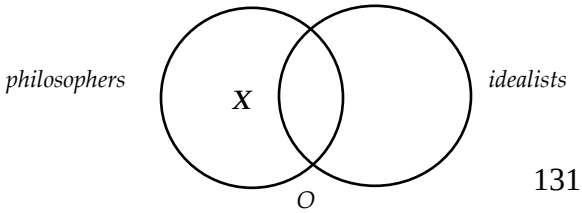
(a) Case1: The propositions have different quantity and quality. If we take an **A** proposition: "All philosophers are idealists." What proposition is the *denial* of this statement? i.*e.*, what proposition differs in both quantity and quality? The particular negative, or the **O** proposition: "Some philosophers are not idealists" so differs.

If we consider the logical geography of the two statements, it becomes obvious that one is the denial of the other. If we diagram an **A**-proposition we have:



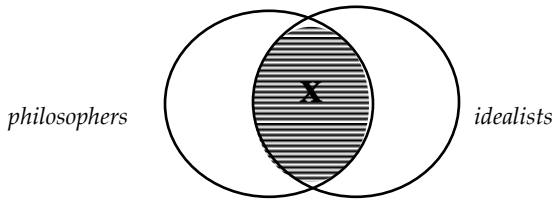
A

and if diagram an **O**-proposition we have:



O

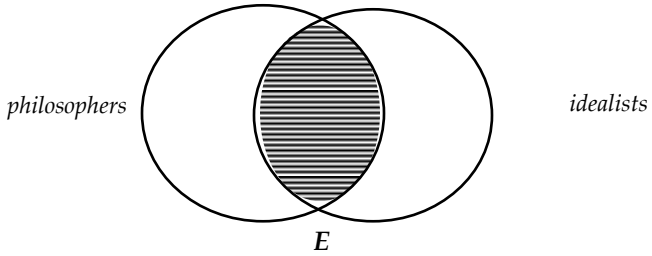
In the **A** the shading indicates no individual is present; in the **O** the "X" indicates at least one individual is present. Put together, they yield:



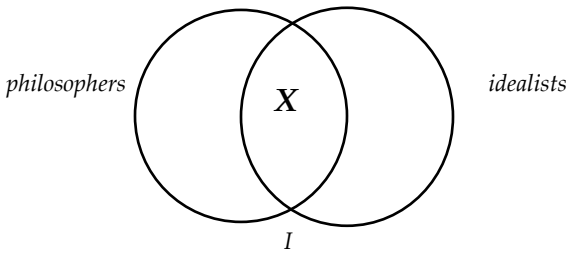
A & O

This kind of opposition is called contradiction and is defined as follows: Two propositions are **contradictories** if they cannot both be true and they cannot both be false. In other words, the statements have opposite truth values.

Similarly, if we take an **E** proposition: "No philosophers are idealists,"



what proposition is the *denial* of this statement? i.*e.*, what proposition differs in both quantity and quality? The particular affirmative or an I-proposition: "Some philosophers are idealists" is so opposed.

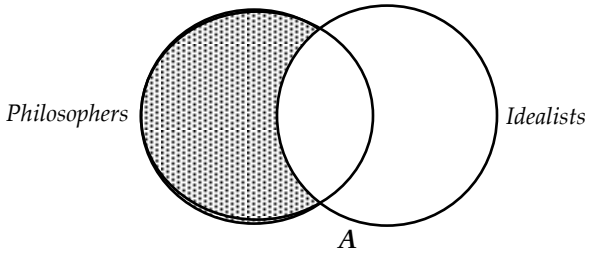


It is clear that if both of these statements *could* be true at the same time the lens area of the diagram would have both shading and an "X." This state of affairs is, of course, logically impossible.

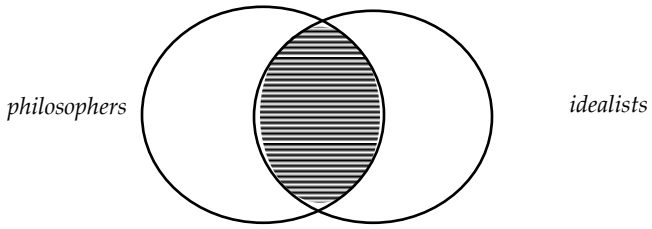
This kind of opposition is also called **contradiction**. Note that there is a kind of symmetry.

(b) **Case 2** :(first part) the propositions differ in quality but are the same in quantity.

If we start again with an **A** proposition: "All philosophers are idealists," the proposition that has the same quantity but differs in quality is the universal negative or the **E** proposition: "No philosophers are idealists."



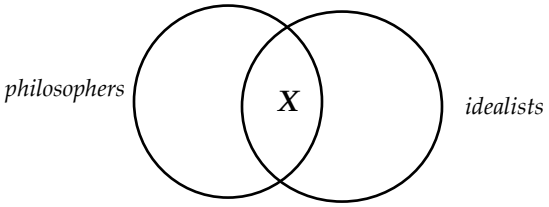
A



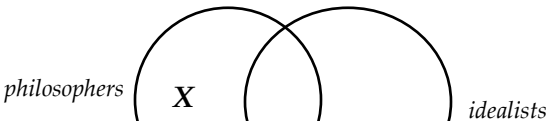
E

This kind of opposition is called *contrariety*. **A** and **E** are *contraries*; two propositions are said to be **contraries** if they cannot both be true, although they might both be false. If both the A and the E *could* be true at the same time, then the subject class would be empty. In the traditional square, we assume that the subject of the proposition refers to something that exists.

On the other hand, if we start with an **I** proposition: "Some philosophers are idealists," the particular negative or the **O** proposition: "Some philosophers are not idealists" is the same in quantity, but differs in quality.



I



This logical relation is called *subcontrariety*. Two propositions are said to be **subcontraries** if they cannot both be false, although they might both be true. In other words, **I** and **O** are subcontraries of each other.

What would happen if both the **I** and **O** statements *could* be false? The diagram shows that if they *were* then the subject class would have to be the empty class!

It is important to note that I and **O** can both be true but they need not be. The only thing known is that they cannot both be false.

Case 3: The propositions are the same in quality but differ in quantity. This is exemplified with the universal affirmative or **A-**proposition: "All philosophers are idealists," and the particular affirmative or the **I-**proposition:

"Some philosophers are idealists."

If the ***A*** statement is true, the ***I*** statement has to be true, (unless there are no members of the subject class, i.e., it's an empty subject class).The truth relations for this logical relation called **subalternation** thus states as follows:

If **A** is *true*, then **I** is *true*. (Otherwise, the subject class is empty.)
If **A** is *false*, then **I** is *undetermined* in truth value.

If **I** is *true*, then **A** is *undetermined* in truth value.
If **I** is *false*, then **A** is *false*. (Otherwise, the subject class is empty.)

Case 3 (part two): our last analysis. Let us look at the **E** proposition:
"No philosophers are idealists," what proposition is the same in quality but differs in quantity from the **E**? The **O** statement does so since it is particular and negative.
"Some philosophers are not idealists."
B. A quick look at the Venn Diagrams yields the following truth values listed below

If **E** is *true*, then **O** is *true*. (Otherwise the subject class is empty.)
If **E** is *false*, then **O** is *undetermined* in truth value.
If **O** is *true*, then **E** is *undetermined* in truth value.
If **O** is *false*, then **E** is *false*. (Otherwise, the subject class is empty.)

In sum, then E and O are related by subalternation. The logical relation described above is called **subalternation**. E is often termed the "*superaltern*" of O, the "*subaltern*."

From the foregoing, the logical relations between the four categorical propositions may be conveniently defined as follows.

(a) Contradictoriness

Two propositions may *contradict* each other. The relation of contradictoriness always involves a universal and a particular of opposite quality; i.e, it involves either an *A* and an *O*, or an *E* and an *I*. If one of these propositions is true, the other must be false; if one is false, the other must be true. "All vegetables have been developed from some uncultivated or wild form of vegetation" – 'Some vegetables have not been developed from uncultivated or wild forms of vegetation". If it is true that *all* vegetables have been developed from some wild form, then it must be false that *some* vegetables have not been so developed; but if it is false that *all* vegetables have been developed from some wild form, then it must be true that *at least* some vegetables have not been so developed.

The relation between contradictories is the same regardless of which of the two propositions is regarded as the original statement.
Schematically:

If p is true, q is false
If p is false, q is true

(b) Contrariety Two universal propositions of different quality may be related to each other as *contraries.* If one of them is true, the other must be false; but if the first is false, the second may or may not be true; it is undetermined. In other words, *both propositions may be false*; but if one is true, the other *must* be false. "All animals can fly"

– “No animals can fly”. If it is true that *all* animals can fly, then it must be false that *no* animals can fly; but if it is false that *all* animals can fly, it is not necessarily true that *no* animals can fly.
Schematically:

If p is true, q is false
If p is false, q is undetermined

(c) Sub-contrariety Two particular propositions of different quality may stand to each other in a relation of *sub-contrariety.* If one of these propositions is true, the other is undetermined; but if one is false, the other must be true. “Some members of this club are wealthy” – “Some members of this club are not wealthy”. If it is true that some are wealthy, it may or may not be true that some are not wealthy; but if it is false that some are wealthy, then it must be true that some are not wealthy – namely, all those of whom it is false to assert that they *are* wealthy.
Schematically:

If p is true, q is undetermined
If p is false, q is true

(d) Superalternation – two propositions stand to each other in the relation of *superalternation* whenever the truth or falsity of the particular is dependent upon the truth or falsity of a corresponding universal. If the universal proposition, or *superalterant*, is true then the particular, or *superalterante*, must also be true; but if the *superalterant* is false, then the *superalterant*e may or may not be true; its truth-value is left undetermined. “All men are wise” – “Some men are wise”. If it is true that *all* men are wise, then it must be true that *some* men are wise; but if it is false that *all* men are wise, then it may be true either that *no* men are wise or that *some* men are wise. The falsity of the *superalterantA* entails merely the statement that *at least some* men are not wise.
Schematically:

If p is true, q is true
If p is false, q is undetermined

(e) **Subalternation** – The relation of universal and particular is somewhat different if the truth of the universal is considered as dependent upon the truth or falsity of the particular. This relation is called Subalternation. If the particular proposition, or *subalternant*, is true, then the universal, or Subalternante, may or may not be true; it is

undetermined. But if the Subalternant false, then the **Subalternante** is also false. "Some diseases are curable" – 'All diseases are curable". If it is true that *some* diseases are curable, then it may or may nor be true that *all* diseases are curable; but if it is false that *some* disease are curable, then it is necessarily also false that *all* disease are curable.
Schematically:

If p is true, q is undetermined
If p is false, q is false

3.2 The Traditional Square of Opposition

The five relations grouped together under "opposition of propositions" pertain to all categorical propositions so long as the subject terms and the predicate terms of the related propositions are identical. The only variations admitted occur in the quantity and quality of the propositions. In other words, transformations of propositions – such as were encountered in preceding sections – are not involved here. The "opposition of propositions" pertains only to the bearing which the truth or falsity of a given proposition has upon the truth or falsity of some other proposition having the same subject term and the same predicate term.

The relationship in question can best be summarized in connection with the "square of opposition" which Aristotle first employed and which has been found useful ever since.

All the relations discussed earlier can be traced or identified my means of this square. Thus, the square as constructed exemplifies in a systematic way the relations that hold between any two of the standard four categorical propositions. The propositions at the end of the diagonals differ in both quality and quantity and are called *contradictories.* Thus *A* and *O* as well as *E* and *I* propositions taken pairwise, are *contradictories.* This means that *A* and *O* propositions cannot both be true and they cannot both be false; if one is true, the other must be false, if one is false, the other must be true.

The propositions at the ends of the two horizontal sides differ in quality only – affirmative to the left, negative to the right. Universals differing in quality, that is *A* and *E* propositions are called *contraries;* they cannot jointly be true, although both might be false. What this means is that the moment one of the propositions is true, the other must be false, but the fact that one is false does not necessarily mean that the other must be false. If one universal is false, the other could be either true or false, that is *undetermined* but once one is true the other must be false. Particular propositions differing in quality, that is, *I* and *O* are subcontraries, they cannot be jointly false although they might both be

true. This means that the truth of one in no wise contradicts the truth of the other; on the other hand, the falsehood of one implies the truth of the other.

Propositions at the ends of the vertical sides differ in quantity only – universals at the top, particulars at the bottom. The propositions here have the same quality but differ in quantity, that is, *A* and *I* or *E* and *O* propositions. Generally, the relationship is said to be that of *subalternation.* If, however, the truth or falsity of the particular is dependent upon the truth or falsity of a corresponding universal, then the relation is said to be that of *superalternation.* If the universal proposition *A* and *E* is true, then the particular *I* or *O* must also be true; but if the universal *A* and *E* is false, the particular, *I* or *O*, may not be true; its truth value is undetermined. On the other hand, if the truth of the universal is considered as dependent upon the truth or falsity of the particular, the relation is called *subalternation.* If the particular proposition, that is *I* and *O* is true, then the universal may or may not be true; it is undetermined. But if the particular, *I* or *O*, is false, the universal is also false.

In summary, what the square expresses is that,

(a) If SaP is True, SeP is False, SiP is True and SoP is False
(b) If SaP is False, SeP is Undertermined, SiP Undertermined and SoP True
(c) If SeP is True, SaP is False, SiP False and SoP True
(d) If SeP is False, SaP is Undetermined, SiP True and SoP Undetermined
(e) If SiP is True, SaP is Undetermined, SeP False and SoP Undetermined
(f) If SiP is False, SaP is False, SeP True and SoP True
(g) If SoP is True, SaP is False, SeP Undetermined and SiP Undetermined
(h) If SoP is False, SaP is True, SeP False and SiP True

On the basis of this logical relations SaP is True is equivalent to SoP is False; that is *A* is equivalent to Not – *O*. Similarly, SeP is true is equivalent to SiP is False; that is *E* is equivalent to Not – *I*. This is understandable because SoP is False (that is Not – *O*) is the contradictory of the SaP is True (that is *A*), while SiP is False (Not *I*) is contradictory of the contradictory of SeP is True (*E*).

4.0 Conclusion

The traditional square of opposition provides a basis for the kind of immediate inference whereby given one of the four basic categorical propositions and a truth value, and using the described relations as rules of inference, a given person can infer the truth value of the remaining three propositions.

5.0 Summary

The term “opposition” was used by classical logicians to apply to the differences in quality (affirmative or negative) and quantity (universal or particular) between standard-form categorical propositions having the same subject and predicate terms. This process is visualized in the square of opposition that shows the logical relationships between categorical propositions with the same subject and predicate.

6.0 Tutor Marked Assignment

For each of the following propositions, assume that the given proposition is true, perform the required inference, and state the resultant proposition and *its truth value.*.

1. What is the contrary of "All joggers are escapists"?
2. What is the contradictory of "Some tillers are not Snappers"?
3. What is the subaltern of "No logic teachers are exciting persons"?
4. What is the subaltern of "No disco music is acid rock"?
5. What is the superaltern of "Some tokunbo cars are expensive"?
6. What is the subcontrary of "Some soft drinks are not nutritional goods"?
7. What is the contrary of "No joggers are depressed persons"?
8. What is the subaltern of "All clowns are beggars"?
9. What is the superaltern of "Some balloons are not high-fliers"?
10. What is the subcontrary of "Some fruits are not foods

If it is true that “Some of our leaders imagine they can fight for empire and credibility at the same time,” what can you say about the truth or falsity of each of the following propositions?

i. All of our leaders imagine they can fight for empire and credibility at the same time.
ii. Some of our leaders do not imagine they can fight for empire and credibility at the same time.
iii. None of our leaders imagine they can fight for empire and credibility at the same time.

If it is true that “All men are equal under the moral law,” what can you say about the truth or falsity of each of the following propositions?

i Some men are equal under the moral law.
ii Some men are not equal under the moral law.
iii No men are equal under the moral law.

If it is true that “No psychologist has ever fully understood the depths of human personality,” what can you say about the truth or falsity of each of the following propositions?

i Some psychologists have fully understood the depths of human personality.

ii All psychologists have fully understood the depths of human personality.

iii Some psychologists have not fully understood the depths of human personality.

If it is true that “Some problems cannot be solved mathematically," what can you say about the truth or falsity of each of the following propositions?

i . Some problems can be solved mathematically

ii All problems can be solved mathematically.

Iii No problems can be solved mathematically.

If it is false that “No men are pugnacious,” what can you say about each of the following propositions?

i Some men are not pugnacious.

ii All men are pugnacious

iii Some men are pugnacious

If it is false that “Some advocates of democracy are in favour of a dictatorship,” what can you say about the truth or falsity of each of the following propositions?

i Some advocates of democracy are not in favour of a dictatorship.

ii No advocates of democracy are in favour of a dictatorship.

iii All advocates of democracy are in favour of a dictatorship.

If it is false that “Some theories do not explain what they were meant to explain,” what can you say about the truth or falsity of each of the following propositions?

i No theories explain what they were meant to explain.

ii. All theories explain what they were meant to explain.

iii. Some theories explain what they were meant to explain.

7.0 References/Further Reading

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Unit 3. Immediate Inference by Converse Relation

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1.0 Introduction

This study unit introduces the learner to another type of immediate inference. Although this type of immediate inference is not a categorical inference, it is essentially a form of conversion that, depends upon a specific logical property of relations.

2.0 Intended Learning Outcomes

It is expected that at the end of this unit, the learner will be able to:

1. Understand and distinguish the three logical properties of relation
2. Differentiate ordinary from relational conversion
3. Make both ordinary and relational converse inferences

3. Main Content

Immediate Inference by Converse Relation

Generally, relations are categorized into *symmetrical*, *asymmetrica*l, or *non-symmetrical*. They are said to be *symmetrical* when they are such a type that if A stands in a given relation to B, B stands in the same relation to A: "A is as large as B" – "B is large as A"; "John is as old as Henry" – Henry is as old as John"; "this tomato is as red as that rose" – "that rose is as red as this tomato"; "Mr. X is as brilliant as Miss Y" – "Miss Y is as brilliant as Mr. X". All relations implying identity, likeness, or similarity are of this type.

Relations are said to be *asymmetrical* when they are of such a nature that if A stands in a given relation to B, B cannot possibly stand in the same relation to A: "A is larger than B"; "Chinyere is more beautiful than Nkechi"; "Okoro is the father of Nwankwo"; "Chima is the successor of Okoro"; "This problem in quantum mechanics is more difficult than that problem in classical physics"; "Nguzu is east of Abiriba". Relations which imply degrees of difference or difference in direction belong to this type.

Relations are said to be *non-symmetrical* when they are such that if A stands in a given relation to B, B may or may not stand in the same relation to A: "Nwafor is in love with Nneka" – "Nneka may or may not be in love with Nwafor"; "Mba praises Oti" – "Oti may or may not praise Mba"; "Adaeze remembers Kalu" – "Kalu may or may not remember Adaeze".

Every relation, regardless of its specific nature, has its converse, and it is this fact which enables the logician to draw certain inferences from given relational propositions.

When the relation expressed in a given proposition is symmetrical, its converse is identical with the original and the inference is for all practical purposes a simple conversion.

Original: (Line AB) is [parallel to] (line CD)
Converse: (Line CD) is [parallel to] (line AB)

Original: (Ugochinyere) is [as beautiful a girl as] (Nneoma)
Converse: (Nneoma) is [as beautiful a girl as] (Ugochinyere)

When the relation in the original proposition is asymmetrical its converse expresses the opposite direction or opposite quality.

Original: (Oji) is [older than] (Nnanna)
Converse: (Nnanna) is [younger than] (Oji)

Original: (Nwagu) is [the father of] Adaeze)
Converse: (Adaeze) is [the child of] (Nwagu)

Original: (Aba) is [west of] (Calabar)
Converse: (Calabar) is [east of] (Aba)

Original: (Monday) [precedes] (Tuesday)
Converse: (Tuesday) [follows] (Monday)

When the relation in the original proposition is non-symmetrical, its converse can be expressed only by a complex statement involving disjunctively an affirmation and a denial.

Original: (Ereke) is [in love with] (Oyidiya)
Converse: (Oyidiya) is or is not [in love with] (Ereke)

Original: (Mr. X) [knows] (Mr. Y)
Converse: (Mr. Y) does or does not [know] (Mr. X)

Inference by converse relation must not be confused with ordinary conversion. The results are quite different in the two cases, as the following examples show:

Relational Conversion:
Original: (Adaku) [recognized] (Uchechi)
Converse: (Uchechi) did or did not [recognize] Adaku

Ordinary Conversion:
Original: (Adaku) is (someone who recognized Uchechi) *A*
Converse: Some (persons who recognized Uchechi) is Adaku *I*

Relational Conversion:

Original: (Dr. Nnamdi Azikiwe) was [a contemporary of] (Dr. Kwame Nkrumah)
Converse: (Dr. Nkrumah) was [a contemporary of (Dr. Nnamdi Azikiwe)

Ordinary Conversion:
Original: (Dr. Nnamdi Azikiwe) is (a person who was contemporary of Dr.Nkrumah) *A*
Converse: Some (person who was a contemporary of Dr.Nkrumah) is (Dr. Nnamdi Azikiwe) *I*

Relational Conversion
Original: (Ndidi) is [younger than] (Obidiya)
Converse: (Obidiya) is [older than] (Ndidi)

Ordinary Conversion
Original: (Ndidi) is (a person younger than Obidiya) *A*
Converse: Some (person younger than Obidiya) is (Ndidi) *I*

4. 0 Conclusion

From the examples given it is evident not only that relational and ordinary conversions differ in the results to which they lead, but also that, as a rule, the relational conversion expresses more clearly the intended or implied meaning of the original proposition. Ordinary conversion leads to artificialities which are foreign to prevailing modes of thought.

5.0 Summary

There are two three logical properties of relations, namely *symmetrical*, *asymmetrica*l, or *non-symmetrical* and inferences can be drawn from given relational propositions. However, there is need not to confuse converse relational inferences with inference in ordinary conversion.

6.0 Tutor Marked Assignment

For each of the following expressions (1) state the type of logical relation involved, (2) give its converse, and (3) state the ordinary and relational conversions indicating whether they express the same meaning or quality.

i. Okonkwo is stronger than Nwoye
ii. Amaka is as strong as Nwadiuto
iii. Akaeme is the father of Nwagu
iv. Calabar is south of Abia State
v. Ngozi loves Chinedu

vi. Okpara can out smart Mbadiwe
vii. Virtue is equal to Knowledge
viii. Obedience is better than Sacrifice
ix. Amara and Uche are as strong as Ugonma
x. Okorie is the uncle of Eleke

7.0 References/Further Reading

Uduma, U.O. (2004) *Modern Symbolic Logic* Enugu: Pan Afric Publishers
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