STUDY SESSION 8

LAWS OF THOUGHT, ELEMENTARY FORMAL RULES OF REASONING AND FALLACIES IN THE THINKING PROCESS

8.1   Introduction

This study session introduces you to the fundamentals of reasoning process in logic. You will be exposed to the rules of valid reasoning process and the fallacies involved in violating the principles of this reasoning process. Let us quickly remind ourselves that the fundamental objective of logic as a field of study is to devise methods and principles for distinguishing correct from incorrect reasoning. These principles are your concern in this session. Indeed, two of the ways by which logic attempts to achieve this objective are by exposing us to:

(i) the laws of thought, and

(ii) the elementary formal rules of reasoning.

Logic employs the laws of thought as an instrument of understanding the principle behind human thinking process. This prompts logic to be defined in some quarters as the science of the laws of thought.[1] The elementary formal rules of reasoning, otherwise known as rules of inference, is introduced by logic to guide us on how to deduce correctly when making claims through arguments. In fact, arguments are validated or invalidated on the ground of the rules of inference. Consequently, logic is generally defined as the study of the methods and principles used to distinguish good (correct) from bad (incorrect) reasoning.[2] This study

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[1] I.M. Copi, *Introduction to Logic*, 5th ed.(New Jersey: Prentice-Hall, Inc., 1982), p.3.
[2] *Ibid.*

session aims at examining the nature of these principles as (i) the laws of thought, and (ii) the rules of deductive inference.

8.1.1 Learning Outcomes for Study Session 8

When you have studied this session, you should be able to:

1. List the three laws of thought and the elementary rules of inference;
2. Translate both the laws of thought and rules of inference to their symbolic forms;
3. Define fallacy; and
4. Identify different forms of fallacies.

8.2 Components of the Law of Thought

The components of the law of thought include the Principle of Identity; the Principle of Contradiction; and the Principle of Excluded Middle. Each of these principles has the status of "law" since they guide human thinking process. When we follow their dictates we create order in our thinking process. The fundamental characteristic of these principles or laws is that they are self-evident truth; nevertheless, we often violate them because we are not mindful of the implication of doing so. Logic as a discipline comes in handy to raise our consciousness in this regard.

(i) The Law of Identity

This law or principle underscores the notion that every object has an attribute peculiar to it. Once an attribute is associated with an entity then that attribute is identical to that entity. For

instance, if you attribute "intelligence" to Aristotle, then we can rightly say that Aristotle is intelligent. Consider the following propositions:

(i)   *If Nigerians are Africans then they are Africans.*

(ii)   *If Obama is an American President then he is an American president*.

(iii)   *If dogs are animals then dogs are animals*.

You can symbolize each of the propositions above as:

$$p \supset p$$

Indeed, every proposition of this form is a "tautology" and hence true. A tautology is any proposition that implies itself.

(ii)   The Law of Contradiction

In reaction to the law of identity, the law of contradiction (or non-contradiction), underscores the idea that we cannot deny an entity the attribute we already associate with it and still affirm that attribute at the same time. Anton puts it aptly, "The same attribute cannot at the same time belong and not belong to the same object in the same respect"[3]. Consequently, it would be a contradiction if you assert that "Aristotle is intelligent and not intelligent". Proposition of this nature is necessarily false. Symbolically,

$$P \bullet \sim P$$

is a false proposition. In essence, the conjunction of a proposition and its negation shall result in falsity.

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[3] J. Anton, "On Aristotle's Principles of Contradiction and its Platonic Antecedents", in *Philosophia*, **2**: 1972, p.267.

(iii)   The Law of Excluded Middle

How do we resolve a contradiction? This is the question addressed in the law of excluded middle. Accordingly, it is *either* we attach an attribute to an entity *or* not. By implication, the statement we aver about anything can either be true or false. We can avoid a contradiction once we follow this principle. Immediately we agree that "Aristotle is either intelligent or not intelligent", we easily escape a contradiction. Again consider the following:

    (a)   Nigerians are either Africans or not Africans.

    (b)   Obama is either an American President or not so.

    (c)   *Dogs are either animals or not animals*.

We can render each of the above symbolically as:

$$P \, v \sim P$$

Any proposition of this form is necessarily true.

In spite of the compelling nature of these laws as rules of right reasoning process, some objections have been raised by critics against them. Advocates of philosophy of change consider the law of identity as untenable in the face of change that characterizes reality. The proposition "Obama is the American President" may be *true* yesterday, but the reality on ground indicates that such statement is *false* today. Trump is the American President today. On a closer look, however, the proposition under consideration is actually not properly formed otherwise it would not have been affected by change. Such a proposition is regarded as an elliptical proposition because its truth values are susceptible to change. Logic deals with complete formulated statements that cannot be affected by change. We can properly formulate the statement under consideration thus:

Obama was American President between 2000 and 2016.

The new formulation simply renders the statement changeless.

The law of contradiction faces the challenge posed by Heraclitean, Marxist and Hegelian philosophies that consider the co-existence of conflicting forces as the foundation of development. It is the conflict between opposite forces that triggers development or changes in reality. In Marx's socio-economic interpretation of societal growth, conflict between two contrasting elements in the society, the class of the rich and the poor, is the propeller of social change. Copi, however, expresses the view that "it is a loose and inconvenient terminology to call these conflicting forces *Contradictory*"[4]. Each of the classes, i.e. the rich and the poor, does not necessarily count as a denial of the other. They merely have conflicting attributes.

The argument that there are propositions which are neither true nor false offers serious challenge for the law of excluded middle. Consider the assertion "God either exists or does not exist". Indeed, it is quite impossible to verify this assertion; how do we verify whether God exists or whether he does not? A movement in philosophy called Logical Positivism concludes that this kind of assertion is meaningless. Nevertheless, Anele avers that the principle of excluded middle is applicable only to propositions, and cannot be legitimately applied to meaningless assertions[5].

8.2.1 In-Text Questions (ITQs)

Name the three laws of thought.

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[4] Copi, *op.cit*, p.285.
[5] D.I.Anele, *Logic and Critical Reasoning*, (Lagos: Biwaz, 2005), p.30.

8.2   In-Text Answers (ITAs)

The law of identity, the law of contradiction and the law of excluded middle

8.3 Elementary Formal Rules of Logical Reasoning (Rules of Inference)

In an attempt to formalize how humans make deductive inference through their thinking, logicians arrive at some rules that are captured in the form of argument. The fundamental characteristic of these rules is that their premises provide conclusive grounds for their conclusions. The rules are: *Modus Ponens* (M.P), *Modus Tollens* (M.T), Hypothetical Syllogism (H.S), Absorption (Abs.), Disjunctive Syllogism (D.S), Addition (Add.), Conjunction (Conj.), Simplification (Simp.), and Constructive Dilemma (C.D.).

Modus Ponens (M.P.)

According to *Modus Ponens*, if the truth of a hypothetical premise is assumed, and the truth of the antecedent of that premise is also assumed, we may conclude that the consequent of that premise is true. Symbolically, we shall have:

$p \supset q$

p

$\therefore q$

In natural language, we can express the rule of *Modus Ponens* with the following argument:

> *If God is infinitely powerful then He is the creator of the universe.*

> *God is infinitely powerful.*

> *Therefore, He is the creator of the universe.*

The chief characteristics of this rule are:

(i) The rule is made up of two premises and a conclusion.

(ii) The major connective of the first premise is the horseshoe.

(iii) The antecedent of the first premise is affirmed in the second premise.

(iv) The conclusion is the consequent of the first premise.

Any argument, whether simple or complex, whose substitution instance satisfies all the characteristics above can be regarded as substitution instance of *Modus Ponens*, and hence valid. The following are the examples of such argument:

$\sim p \supset \sim s$

$\sim p$

$\therefore \sim s$

$(D \lor N) \supset J$

$D \lor N$

$\therefore J$

$(F \supset N) \supset \sim (L \lor \sim T)$

$F \supset N$

$\therefore \sim (L \lor \sim T)$

Owing to lack of deep understanding of the rule of "M.P.", we sometimes make the mistake of swapping the variables of the second premise and the conclusion. Such move cannot result in valid argument. In fact a fallacy is said to have been committed by this move; this is the fallacy of "affirming the consequent". Such an argument would reads thus:

$p \supset q$
q
$\therefore p$

This argument is invalid since the consequent of the first premise has now become the second premise. Normally, it is the antecedent of the first premise that ought to become the second premise. This is why the rule is sometimes called "affirming the antecedent". Of course, that is exactly what it does. It makes a conditional statement, and then *affirms the antecedent* of that conditional statement, and draws as a conclusion *the consequent* of that conditional statement.[6] The point being made shall become clearer by the time we produce the semantic interpretation of an argument that affirms the consequent. Let us consider the argument below:

if Democritus actually postulated the atomist theory, then he is scientifically oriented.

Democritus is scientifically oriented.

Therefore, Democritus actually postulated the atomist theory.

The invalid nature of this argument can easily be intuited effortlessly. Democritus, being scientifically oriented, is not the stated condition for being affirmed as the postulator of the atomist theory. The conclusion is *non-sequiture* from the premises.

***Modus Tollens* (M.T.)**

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[6] B.N. Waller, *Critical Thinking: Consider the Verdict*, (New Jersey: Prentice-Hall Inc.,1988) p.84.

According to *Modus Tollen*, if the truth of a hypothetical premise is assumed, and the falsity of the consequent of that premise is also assumed, we may conclude that the antecedent of that premise is false. Symbolically, the rule reads:

$p \supset q$
$\sim q$
$\therefore \sim p$

In natural language, we can express the rule of *Modus Tollens* in the following argument:

If Georgias were a sophist, then he would hold the belief that knowledge is relative.

Georgias does not hold the belief that knowledge is relative.

Therefore, Georgias is not a sophist.

The chief characteristics of this rule are:

(i) The rule is made up two premises and a conclusion.

(ii) The major connective of the first premise is the horseshoe.

(iii) The second premise is the denial of the consequent of the first premise.

(iv) The conclusion is the denial of the antecedent of the first premise.

Any argument, whether simple or complex, whose substitution instance satisfies all the characteristics above can be regarded as substitution instance of *Modus Tollens*, and hence valid. Consider the following argument:

$K \supset (T \bullet O)$

$\sim (T \bullet O)$

$\therefore \sim K$

$F \supset \sim S$

$\sim \sim S$

$\therefore \sim F$

A somewhat similar to the form of "M.T." but not deductively valid because it denies the antecedent of the first premise in the second premise should however be avoided. For instance,

$W \supset N$

$\sim W$

$\therefore \sim N$

The fallacy committed here is the fallacy of denying the antecedent. The, invalidity of the argument shall become glaring by the time we express it with natural language-couched argument like the following;

If Socrates was morally upright, then, he would have lived a peaceful life.

Socrates was not morally upright.

Therefore, Socrates did not live a peaceful life.

The argument here no doubt does not conform to the natural way of thinking, hence any argument of this form would be invalid. There is nothing in the first premise (implicitly or explicitly) that indicates that Socrates not being morally upright is *sine qua non* to his not living a peaceful life

Hypothetical Syllogism (H.S.)

This is an elementary valid argument involving three conditionals in which the consequent of the first conditional becomes the antecedent of the second conditional while the antecedent of the first premise becomes that of the conclusion and the consequent of the second premise becomes that of the conclusion. This is a chain argument that is valid because of the transitive character of the entailment relation.[7] Symbolically, the rule reads:

$p \supset q$
$q \supset r$
$\therefore p \supset r$

We can express the argument thus:

If Anselm was a contemporary of Aquinas, then he was a medieval philosopher.

If Anselm was a medieval philosopher then he proved the existence of God.

Therefore, if Anselm was a contemporary of Aquinas then he proved the existence

of God.

The chief characteristics of this rule are:

(i) It comprises two premises and a conclusion.

(ii) Each of the premises is a conditional statement hence its major connective is the horseshoe.

(iii) The consequent of the first premise becomes the antecedent of the second premise.

(iv) The antecedent of the first premise becomes the antecedent of the conclusion.

(v) The consequent of the second premise becomes the consequent of the conclusion.

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[7] P. Wright, *Valid Thinking: An Introduction to Logic*, (California: Wardsworth, 1971), p.64.

The following are some of the arguments with the substitution instances of "H.S." in their symbolic form:

Absorption (Abs.)

According to the rule of "Absorption", when a conditional statement "p $\supset$ q" is made, the absorption permits the inference that "p" can imply both "p" and "q". The rule symbolically states:

$$p \supset q$$
$$\therefore p \supset (p \bullet q)$$

When expressed with natural language, the argument may appear clumsy; nevertheless, it is an elementary valid argument. Consider the example below:

If Locke is a democrat then he believes in the equality of all men.

Therefore, if Locke is a democrat then Locke is both a democrat and a believer of the equality of all men.

The following are the chief characteristics of "Abs.":

(i) The rule has only one premise with a conclusion.

(ii) The premise and the conclusion are conditional statements hence with the horseshoe as the major connective.

(iii) The conclusion is a complex argument involving a bracketed argument.

(iv) The antecedent of the premise is also the antecedent of the conclusion.

(v) The consequent of the conclusion is a conjunction of both the antecedent and consequent of the first premise.

The following are some of the argument with the substitution instances of "Abs.":

$L \supset (N \bullet O)$
$\therefore L \supset [L \bullet (N \bullet O)]$

$\sim J \supset T$
$\therefore \sim J \supset (\sim J \bullet T)$

Disjunctive Syllogism (D.S.)

The rule of the Disjunctive Syllogism is an elementary valid argument form in which one premise is a disjunction, another premise is the denial of one of the two *disjuncts*, and the conclusion is the truth of the other *disjunct*. The rule symbolically states:

$p \ v \ q$

$\sim p$

$\therefore q$

A natural language argument of this form reads:

Hegel can either be a subjective idealist or an objective idealist.

Hegel is not a subjective idealist.

Therefore, Hegel is an objective idealist.

The chief characteristics of the rule are:

(i) It has two premises and a conclusion.

(ii) The major connective of the first premise is the disjunctive.

(iii) The second premise is a denial of the first *disjunct* of the first premise.

(iv) The conclusion is the second *disjunct* of the first premise.

The following are some of the arguments with the substitution instances of "D.S.":

$(L \bullet T) \lor S$
$\sim (L \bullet T)$
$\therefore S$

$\sim K \lor \sim U$
$\sim\sim K$
$\therefore \sim U$

Addition (Add.)

According to this rule, given the premise of an argument, Addition permits the inclusion of another proposition with the previously given premise, and connecting the two with the disjunction to form the conclusion of the argument. The rule is sometimes called Logical addition. The rule can be symbolized in the following way:

p

$\therefore p \lor q$

When constructed with the natural language, the argument can be in this form:

Epistemologists are philosophers.

Therefore, epistemologists are philosophers or knowledgeable people.

The chief characteristics of the rule are:

(i) It is made up of a single premise and a conclusion.

(ii) The major connective of the conclusion is the disjunction.

(iii) It is the only rule in which one of the constituent elements of its conclusion never appears before in its premise i.e. what is not already contained in the premise is found in the conclusion.

The following are some of the arguments with the substitution instances of "Add."

S

$\therefore S \ v \sim R$

$J \ v \ T$
$\therefore (J \ v \ T) \ v \sim (J \ v \ T)$

Conjunction (Conj.)

This rule permits the conjunction of two individually existing statements that are assumed to be true. Each of the two statements shares the slot of each of the premises that constitute the parts of the rule. When stated symbolically, the rule appears thus:

p

q

$\therefore p \bullet q$

And when applied to natural language we shall have:

Plato is a rationalist.

Aristotle is an empiricist

Therefore, Plato is a rationalist and Aristotle is an empiricist

The chief characteristics of the rule are:

(i)   It is made up of two premises and a conclusion

(ii)   The first and the second premises conjoined to become the conclusion using the *dot* symbol.

The following are some of the arguments with the substitution instances of "Conj.":

J

~S

$\therefore J \bullet \sim S$

L v *O*
T • *U*
$\therefore (L$ v $O) \bullet (T \bullet U)$

Simplification (Simp.)

While the rule of conjunction works towards the unification of two independently existing statements, and thus moves from simpler to complex statement, the rule of *Simplification* aims at the division of two conjoined statements, hence moves from complex to simpler statement. It plays the role of simplifying a rather compounded statement. According to the rule, if the conjunction of two statements is given, the rule permits that we can validly separate the first conjunct to exist on its own and form a conclusion. It is a rule for liberating the first conjunct.

The symbolical representation of the rule reads:

p • *q*

$\therefore p$

We can express the natural language form of the rule thus:

Aristotle is an empiricist and a scientist

Therefore Aristotle is an empiricist.

The chief characteristics of *Simplification* are:

(i) It is made up of a single premise and conclusion.

(ii) The first premise is a compound of two statements linked with the conjunction symbol.

(iii) The first conjunct of the first premise becomes the conclusion of the argument.

The following are some of the arguments with the substitution instances of simplification.

$\sim J \bullet U$
$\therefore \sim J$

$(S \ v \ O) \bullet K$
$\therefore S \ v \ O$

Constructive Dilemma (C.D)

Constructive Dilemma as a rule of inference makes use of a combination of at least three logical connectives. The rule consists of an argument in which one premise, the major, is the conjunctive assertion of two hypothetical propositions, and in which a second premise, the minor, is an alternative proposition.[8] The minor affirms alternatively the antecedents of the major while the conclusion affirms, alternatively the consequents of the major premise. When symbolized, the argument appears thus,

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[8] *Ibid.*, p.160

$(p \supset q) \bullet (r \supset s)$

$p \vee r$

$\therefore q \vee s$

In natural language for, the "*C.D*" may appear thus:

If Hume is a rationalist then he must accept only the reality of the soul and if he is an empiricist, he must accept only the reality of the body.

Hume is either a rationalist or an empiricist.

Therefore, Hume must either accept only the reality of the soul or only the reality of the body.

From the above, we can deduce certain crucial characteristics of "C.D.":

(i) The rule is made up of two premises and conclusion.

(ii) The rule involves at least four different variables (the largest employed among the

rules).

(ii) The major connective of the first premise is the dot (conjunction) while the minor connective is the horseshoe (implication).

(iv) The major connective of the minor premise is the disjunction (wedge)

(v) The major connective of the conclusion is the disjunction (wedge).

(vi) The first *disjunct* of the second premise (minor premise) is the antecedent of the conditional statement that forms the first *conjunct* of the first premise.

(vii) The second *disjunct* of the second premise is the antecedent of the conditional statement that forms the second *conjunct* of the first premise.

(viii) The first *disjunct* of the conclusion is the antecedent of the conditional statement that forms the first *conjunct* of the first premise.

(ix) The second *disjunct* of the conclusion is the consequent of the conditional statement that forms the second *conjunct* of the first premise.

In line with the above characteristics, the following are some of the arguments with substitution instances of "*C.D.*":

$(J \supset D) \bullet (N \supset O)$
$J \ v \ N$
$\therefore D \ v \ O$

$[(W \bullet S) \supset L] \bullet (F \supset \sim C)$
$(W \bullet S) \ v \ F$
$\therefore L \ v \sim C$

With the semantic analysis of the nine rules of inference as done above, it would be easy for you to have a sharp grasp of the symbolic rendition of the rules. The rules are no more seen as mere combination of symbols but as something that has its foundation in the natural way we think about things.

8.3.1   In-Text Questions (ITQs)

List the nine rules of inference

Modus Ponens, Modus Tollens, Absorption, Disjunctive Syllogism, Hypothetical Syllogism, Constructive Dilemma, Addition, Simplification, Conjunction

8.4 What is Fallacy?

Following the products of our mental cognition, we realise the daily occurrence of erroneous reasoning processes which appear to be valid and correct at first, but upon better scrutiny, we see the errors in these forms of reasoning – fallacies. Fallacy can be seen as a type of argument that tends to be persuasive but does not provide logically adequate grounds for a change in belief. By this, we know that fallacies tend to be persuasive; often, or even most of the time, they succeed in changing belief, although they need not always do so. Fallacies can be said to be viruses, and like viruses on the human body, they attack human reasoning at places where it is vulnerable; the act of studying these fallacies can serve as an inoculation, revealing to us and helping us identify places where human reasoning is vulnerable.

Fallacies are to be differentiated from arguments that are wrong. Despite the many forms by which we can say an argument is wrong, none of such cases can be compared to the state of it being fallacious. Fallacies occur when the premises of an argument appear to support the conclusion, but do not in fact do so. Fallacies for us mean typical errors that often occur, are mostly used (innocently and deliberately), and are often deceiving as related to reasoning.

A fallacy, (Latin, '*fallere',* to deceive) is an argument that is incorrect, but may appear to some in some contexts to be a correct argument. Bad reasoning occurs when people construct arguments that are fallacious without realizing that they are doing so. Fallacies may be

divided up into two categories, formal and informal. Informal fallacies themselves can be subdivided into fallacies of relevance and fallacies of ambiguity.

8.4.1 In-Text Questions (ITQs)

1. What is fallacy?

2. The term fallacy is derived from the Latin word ---

8.4.2 In-Text Answers (ITAs)

1. Fallacy can be seen as a type of argument that tends to be persuasive but does not provide logically adequate grounds for a change in belief.

2. '*Fallere',* to deceive

8.5 Formal Fallacies

Formal fallacies are fallacious by virtue of their logical form. They tend to be persuasive because they resemble valid logical forms. The formal fallacies always have a deductively Invalid form. Find that form, and you have found the fallacy. We must always remember that to the extent to which formal fallacies are persuasive, it is the case only because they resemble valid forms, and can so exploit problems which people have with conditionals and disjunctions.

Types of Formal Fallacies

Formal Fallacies can be classified into 4 major types, Fallacies of Propositional Logic, Fallacies of Syllogistics, Fallacies of Predicate Logic and Fallacies of Modal Logic.

1. *Affirming the Consequent* – A Type of Fallacy of Propositional Logic, this formal fallacy appears in a form that is often mistaken for Modus Ponens, which is a valid form. The first premise being a conditional statement, the "if"-part is the antecedent, while the "then"-part is the consequent.

Formal Fallacy: P ⊃ Q   Valid Form: P ⊃ Q

             Q   P

          Therefore, P   Therefore, Q

Example

If Lucas is a Nigerian, then he understands Yoruba

It is the case that Lucas understands Yoruba

Therefore, Lucas is a Nigerian

2. *Denying the Antecedent*– Another type of Fallacy of Propositional Logic, this formal fallacy appears in a form that is often mistaken for Modus Tollens, which is a valid form.

Formal Fallacy: P ⊃ Q   Valid Form: P ⊃ Q

             ~P   ~Q

          Therefore, ~Q   Therefore, ~P

Example

If Lucas is a Nigerian, then he knows Fela

Lucas is not a Nigerian

It follows that he does not know Fela

3. ***Affirming a Disjunct*** – Also a type of Fallacy of Propositional Logic, this formal fallacy occurs in a form that is often mistaken for Disjunctive Syllogism, another valid form.

Formal Fallacy: P v Q   Valid Form: P v Q

                    P   ~P

         Therefore, ~Q   Therefore, Q

Example

Either you bathe daily, or you will have body odour

You bathe daily

So, you will not have body odour

4. ***Converting a Conditional*** – This formal fallacy occurs when one tries to convert the antecedent of an argument to the consequent, by so doing, losing validity of such an argument.

Formal Fallacy: P ⊃ Q

     Therefore, Q ⊃ P

Example

If Tunde was NAPS President, then he was popular

Therefore, if Tunde was popular, then he was NAPS President

Other types of Formal Fallacies include the following:

➢ **Fallacies of Propositional Logic**

5. Improper Transposition

6. Improper Disjunctive Syllogism (Affirming One Disjunct)

- **Fallacies of Syllogistics**

  7. Four Terms, quaternioterminorum (due to ambiguous middle term)

  8. Undistributed Middle Term

  9. Illicit Major (Predicate term distributed in conclusion but not in major premise)

  10. Illicit Minor (Subject term distributed in conclusion but not in minor premise)

  11. Illicit Affirmative

  12. Illicit Negative

- **Fallacies of Predicate Logic**

  13. Illicit Quantifier Shift

  14. Unwarranted Contrast

  15. Illicit Substitution of Identicals (Masked Man)

- **Fallacies of Modal Logic**

  16. Modal Fallacy

8.5.1 In-Text Questions (ITQs)

List the four major types of formal fallacies.

8.5.2 In-Text Answers (ITAs)

Fallacy of Propositional Logic, Fallacy of Syllogistics, Fallacy of Predicate Logic and Fallacy of Modal Logic

8.6 Informal Fallacy

Informal Fallacies do not have bad forms, but make other kinds of errors, typically violating considerations for evidence, relevance and clarity. Informal fallacies are considered to be murky as a result of their being unsystematic as opposed to formal fallacies which are systematic, rigid and quite traditional. Being quirky with no force of law but only explanatory power, they identify classes of less conclusive arguments that recur with some frequency, but they do not contain formal laws that make their conclusion illegitimate. Informal fallacies are best used when we encounter arguments that we know are wrong, but cannot say why. Informal fallacies have been classified by various writers differently, separating one form of appearance and occurrence from another. Some of these classifications include;

1. Pathos, Ethos and Logos – where Fallacies of Pathos rests on the flaws in the way arguments appeal to the emotions and values of the audience; Fallacies of Ethos rests on the flaws in the way arguments appeal to the character of opponents or of sources and witnesses within an argument; Fallacies of Logos rests on flaws in the relationship among statements in an argument.

2. Fallacy of Evidence, Fallacy of Relevance: Credibility, Confusion, Manipulation, Inductive Fallacies and Fallacy of Clarity.

3. Fallacies of Relevance, Defective Induction, Fallacies of Presumption and Ambiguity.

For the purpose of this write-up, we categorise informal fallacies into two; Fallacy of Relevance and Fallacy of Ambiguity.

8.6.1   **In-Text Questions (ITQs)**

Which category of fallacies are considered problematic due to their lack of form?

8.6.2 **In-Text Answers (ITAs)**

Informal fallacies

8.7 Fallacy of Relevance

There are fallacies that have conclusions that do not logically follow from the premise from which they issue; Fallacies of relevance are mistakes, and have been said to be better called fallacies of irrelevance as they point to the absence of any real connection between the premises and the conclusion of the argument. Since there is no connection, the premises cannot possibly establish the truth of the conclusion. But the premises are usually psychologically relevant; they have some emotional impact on the readers. The premises contain information which may appear to be relevant but which in fact is not relevant in establishing the conclusion as true.

1. *Argumentum ad Populum (Appeal to People/Popularity)* – Commonly called the Bandwagon, as a result of the nature to which it takes, feeding on the emotions of the people based on popular opinion and dominating constructs at the moment, this fallacy occurs if and only if the argument tries to justify its conclusion by appealing to the audience's emotions. Relying so much on emotion rather than on reason, in place of evidence, the enthusiasm of the audience is excited through the use of expressive language, for or against some cause or issue. But the occurrence of this enthusiasm has nothing to do with the truth of the conclusion.

   The popularity of what it accepts is irrelevant compared to its actual merit. This fallacy shows how gullible people allow themselves to be as a result of what is popular at the moment, making them believe the popular opinion as valid and true. This fallacy is

mostly used by propagandists and advertising agencies as they try to convince the populace into buying a product because everyone else is buying and using it. For example: *"Using Durex is the right thing since it's the most commonly bought condom to prevent STI, STD and unwanted pregnancy, so buy Durex". "Living together before marriage is the right thing, since that's what every couple does now."*

2. ***Argumentum ad Misericordiam (Appeal to Pity)*** – The goal of this fallacy is to justify actions or issues through the arousal of sympathy and pity from the audience over the consequence of such action or issue. This fallacy is mostly used by lawyers in the court room, as they try to give arguments that would appeal to the emotions of the judge and the jury so as to find their client innocent, even if circumstantial, of whatever crime he is being accused of. Again, the argument relies on emotion rather than on reason; pointing out the unfortunate consequences that will follow if one is to act otherwise, it tries to convince the audience, after which we would then feel sorry. Despite this fact, this fallacy can be said to have proven its worth especially when used for humanistic aids and the general betterment of the human race, especially by priests and other religions, fund raising bodies, charity organization etc. For example; *"If you fail to make contributions to this charity, a lot of children in Sudan will be in danger all their lives, experiencing the terrible war". "My Lord, I ask that you consider my client's reason for being charged, she received a call about her none-year-old crippled son being in a bus accident and had to rush down to the hospital, which was why she was given a speeding ticket". "I was not in my right state of mind, my parents were in a terrible train accident and I just got the call on the morning of my exams. There was no way I could write the exams on my own and I couldn't defer the semester, which was why I cheated in the exam".*

3. ***Argumentum ad Baculum (Appeal to Force)*** – This fallacy tends to appear in form of threats and force, where one is given little or no option than to go with the rulings of the

argument. Mostly used by persons in position of power, like parents, political leaders, group leaders in projects and assignments, class representatives etc, the threat is used to bring about unfortunate consequences for anyone who dares to disagree with his/her proposition. Though this fallacy serves its use in an effective way, to get one to agree or disagree with whatever the one in power wills, it does not offer reasons for believing such propositions or statements to be true. For example: *"If you do not vote me to represent you in the Senate, don't expect anything to be done for you all here, you will be forgotten"*, *"What do you mean by there's nothing wrong with homosexuality, and love is love? If that's what you go to school to learn I will not pay your fees anymore, you better start thinking right".*

4. ***Argumentum ad Hominem (Argument Against the Person)*** – Literally, the phrase *"ad homimen"* translates to mean *"to the person"*; this fallacy occurs in two different ways – Abusive and Circumstantial, and in both cases, the fallacy is directed at the person instead of the thing (ad rem) being discussed or addressed to the specifics of the case. Instead of arguing against someone's opinion, the argument attacks the person who holds that opinion by showing him as disreputable in some way. So it is saying that the opinion must be false because of the person who believes it to be true. This fallacy differs from the Fallacy of Poisoning the well, because, poisoning the well makes an advance discredit and opposition.

I. ***Ad Hominem Abusive*** – an argument is said to have committed this fallacy when it purports to discredit and insult the person who holds the view rather than addressing the argument itself. For example, *"Wole Soyinka keeps talking about his grievances with the ruling government and their decisions that affect the masses, but who's Soyinka to speak? He doesn't even believe in God and he's a polygamist."*

II. ***Ad Hominem Circumstantial*** – An argument is said to have committed the fallacy ad hominem circumstantial, when it goes to discredit an issue or an argument by appealing to the circumstance or characteristics of those who hold the view: *"You definitely will support APC and their change agenda, after all your father is a party member and part of the senate"*, *"Senator Oriola's view on the petroleum tax should be discounted because her husband owns a huge oil company"*.

5. ***Red Hearing*** – This fallacy derives from using a Red Herring, a highly odiferous fish, to throw dogs off the scent they are meant to be tracking; it is the process of throwing an audience off track by raising unrelated or irrelevant points. A deliberate attempt to change the subject or divert the argument from the real question at issue to some side-point. This fallacy is used by smart lawyers to their advantage: *"The police keeps disturbing patriotic citizens who pay their tax, arresting me for reckless driving; yet they fail to arrest the leaders who loot our naira and those rapists and criminals on the street"*.

6. ***Straw Man*** – this argument occurs when one oversimplifies the arguments of an opponent, making it easier to refute or ridicule; rather than recreate and summarize the opponent's arguments fairly, you make up easier arguments you wish your opponent had made which are far easier to knock down like a straw man in a corn field. In other words, it is an attempt to establish a conclusion by overstating, exaggerating, or over-simplifying the arguments of the opposing side.

7. ***Argumentum ad Ignorantiam (Fallacy of Ignorance)*** – like the name implies, this means fallacy of ignorance. This fallacy is committed when one makes a claim directly opposite to a premise to be its conclusion; it occurs as a result of our limited knowledge on the facts that make up the existence or workability of a thing or an event. Here, the speaker tries to deceive his audience with the use of his own ignorance to give basis to his so-called knowledge. The speaker only says that which he thinks is the case because the

opposite has not been proven yet; even with this method, the conclusion still doesn't follow the given premise. This is because the premise may still be true, but has no proof of justification yet; the absence of evidence is not the evidence of absence. For example, *"No one has ever proven that there are witches and people with supernatural abilities, therefore, there are no witches or people with supernatural abilities"*, *"It has never been proven that UFOs exist, so no UFOs exist"*. *"Since no one has seen or found the Tree of life, we can infer that such tree never existed."*

8. ***Argumentum ad Verecundiam (Appeal to Inappropriate/Wrong Authority)*** – We tend to experience this fallacy daily, yet we fail to notice such occurrence; we see it daily through media outlets, we express it ourselves to impress people or to get them to give in to what we want by appealing to a wrong authority as a point of reference. For example, I once made my niece try the fruits she does not like by telling her Sofia the First likes these fruits and insists children take it. Using the knowledge of her favourite cartoon character, I was able to make her do as I please. This fallacy is appealed to when one uses famous people to testify to cases where these persons have no professional competence, like when students attempt a quotation during exams, misplacing a quote with another speaker. Because we know these authorities, or believe they have some sort of knowledge, we assume that they have knowledge about things outside their expertise too.

9. ***False Cause (Post Hoc, Ergo Propter Hoc)*** – This fallacy is translated to mean "after this, therefore because of this", and it occurs when a sequential relationship is mistaken for and taken to be a causal relationship. This fallacy is committed by a lot of people, especially those who crave to believe there's a reason for everything, so they try to give a causal relationship to all they experience. But to say a causal relationship exists requires that we eliminate every other possible cause. This fallacy occurs when one mistakenly assumes that, because the first event preceded the second event, it must mean the first

event caused the later one, following the principle of causality. For example; *"My right hand kept itching me this morning. Later this noon my bank account was credited. My itching hand must have caused the credit alert", "A black cat crossed my path last night. This morning, my grandfather dies of a heart attack. So the black cat must have caused his death".*

10. *Hasty Generalization (Dicto Simpliciter)* – This fallacy occurs with the making of a broad generalization on the basis of very little evidence. As such, we draw general conclusion without examining all the relevant data. As expected, we cannot examine everything; but still, the sample must be carefully selected, and large enough. This fallacy is committed when we claim to know a lot about a thing, just because we know supposed basic facts to understanding the thing; it equally occurs as a result of us gathering inferences from what we presume to be the foundations to knowing a thing, and with such inferences, make general claims and affirmations. As such, the truth and validity to our notions do not stand as right, but rather even infringes on the truth.

11. *Fallacy of Accident* – Known as *ad dicto simpliciter ad dictum secundum quid* in Latin, this fallacy is committed if and only if one tries to justify an argument's conclusion by treating an accidental feature of something as essential to the premise of the argument. It is simply the application of a general rule to a particular special case or instance where it is not relevant For example, *"Suppose a friend, in his right mind, gives me his car keys asking me to prevent him from driving when he's drunk, and then asks me for the car keys when not in his right mind. Am I supposed to give him the car keys, allowing him leave? Of course: Everyone knows and agrees that you should give back what you borrow". "Thou shall not kill: it is wrong to kill anyone, not even a murderer, a criminal or even an assassin."* The application of a general rule to a particular case when accidental

circumstances render the general rule inapplicable, is when this fallacy is committed; for the truth in general might not be absolutely true without qualification.

12. *Fallacy of Complex Question* – This fallacy may come in form of rhetoric, confusing the audience on what answer is to be expected of them. It entails asking questions with the deliberate intention to confuse and place one in a compromising position, giving yes or no answer to such questions is highly incriminating. At face value, the questions appear harmless and simple when in actual fact they are complex and quite intricate. For example, *"Have you stopped beating your wife?" "Do you agree with the Change mantra that has taken hold in every part of the country?" "You do agree with Capitalism, don't you?"* This fallacy is mostly used by lawyers and journalists when questioning people. Another fallacy similar to this, is the Fallacy of False Dilemma (Either/Or) where an argument is over- simplified so that only two options or choices appear possible, sometimes one option is made to seem less desirable so one can choose the other as the right choice.

13. *Begging the Question (Petitio principia)* – *Ignoratio Elenchi (Irrelevant Conclusion)* – The speaker tries to establish the truth of a proposition by offering an argument that actually provides support for an entirely different conclusion. It can often distract the audience, and we don't notice that the conclusion just misses the point. For example:

> *Children should not be brought up with negativity. Parents who had good childhood tend to be positive parents. Therefore, mothers should stop being negative.*

Driven with the goal of making sense in our argument we often get excited with the major thrust of argument, thereby repeating our premise in our conclusion. When one assumes

as a premise of one's argument the very conclusion he intends to rove, the fallacy of petito principia is committed. Here, one can easily notice the overemphasis placed on the information one hopes to pass across. It occurs when one assumes the truth of what one tries to prove, it can also occur in circular arguments.

For example: *Jide can eat any delicacy given to him*

He doesn't have any preference

Jide eats a lot

14. ***Ignoratio Elenchi (Irrelevant Conclusion)***–People get carried away in their argument, to the point of giving so much details as part of the premise to an argument, only to give a conclusion that is far from the expected. This fallacy is committed when one leaves the main point in an argument and goes ahead to draw conclusion or state something else, not related to the point under consideration, thereby stating another conclusion. It is mostly experienced when one fails to have enough evidence for one's argument, or lacks the fire power to stand against an opponent's attacks.

8.7.1   In-Text Questions (ITQs)

1. Which of the fallacies appeals to pity or sympathy?

2. Which of the fallacies appeals to the people?

8.7.2   In-Text Answers (ITAs)

1. *Argumentum ad Misericordiam*

2. *Argumentum ad Populum*

8.8 Fallacies of Ambiguity

Fallacies of Ambiguity, also known as Fallacies of Clearness are mostly general deductive arguments which appear to be valid but are not because of a shift in the meaning of a word, phrase, or sentence. Since not all fallacies have conclusions that do not follow the issued premise, some arguments occur whose formulations contain ambiguity, shifting meaning and tend to change the course of the arguments. The change in the meaning of words of phrases could be deliberate or just as a result of inattention: a term may have one sense in a premise, but a different sense in the conclusion. As long as the inference depends on these changes in meaning based on the ambiguity, the argument is fallacious.

1. *Equivocation*–The goal of every word geared towards communication is the exercise of meaning. As such, words are geared towards meaning themselves. So it is not surprising to notice a word having varying meanings; it is not impossible for words to have more than one literal meaning. The moment one confuses the actual meaning of a word or a phrase when used at a time, this fallacy tends to rise. It occurs when words that have double meanings are used in a way that springs confusion and misinterpretation. This occurs when a term or phrase is used in different senses in the premises and in the conclusion. It often occurs with relative terms, and those cases can be harder to notice. As such, when a word is used such that it could have two meanings, it can be said to equivocate. For example: *I saw Tade at the Bank*. Bank here could mean the financial institution or the river (bank). *"The sign said, 'fine for parking here'. So since it was fine, I parked."*

2. *Composition and Division* – This fallacy occurs in two different ways. For the fallacy of Composition, sometimes called Part-For-The-Whole (Pars pro toto), it involves the projection of the qualities of parts of a thing for the whole. This fallacy involves

attributing a thing to a whole or a group because it can be attributed to parts of the group; a bit is picked from the part and then generalised to apply to the whole as well based on the idea that what is true of the part is true of the whole. The Fallacy of Division is the inverse of the Fallacy of Composition. It involves arguing from the properties of the whole for the parts; it involves attributing the qualities of the whole group on the individual parts that make up the group.

3. *Amphiboly* – An argument commits the fallacy of amphiboly when it tries to justify its conclusion by relying on an ambiguity in a word or phrase. This fallacy is mostly common with oracular predictions. It occurs as a result of the awkward combination or arrangement of words, so much that it causes misunderstanding. An amphibolous statement might be true in one interpretation and false in another; when it is used in the premise in one interpretation, and the conclusion is drawn based on the other one, that's a fallacy. For example: *"The tour guide said that standing on Third Mainland Bridge, the Lekki Bridge can easily be seen. Thus, the Lekki Bridge is in Third Mainland Bridge."*

4. *Accent* – This occurs in an argument when one tries to justify its conclusion by relying on presuppositions arising from a change in stress in a premise; it is the placement of wrong emphasis or the wrong accentuation of words and phrases while speaking and writing, such that the original or intended meaning is perverted. It mostly occurs through the use of quotation marks and italicized words. For example: *"It is wrong to lie to your parents."* This statement makes it seem like one can lie to anyone else but one's parents.

8.8.1 **In-Text Questions (ITQs)**

Name any two fallacies of ambiguity

8.8.2 In-Text Answers (ITAs)

Equivocation, Division, Accent, Amphiboly

8.9 Summary of Study Session 8

At this point, it should be clear to you that the fundamental laws of thought are: *the law of identity, the law of contradiction,* and *the law of excluded middle*. In our discussion, we shown that these laws are so formulated to follow the logical structure of the human reasoning process. While the first law, as discussed, states that *if any statement is true then it is true*, the second asserts that *no statement can be both true and false at the same time*. According to the third law, *any statement is either true or false*. These laws have their symbolic representations.

From your reading so far, you can see that the elementary set of rules employed in constructing formal proofs of validity, like the laws of thought, are also formulated to follow the logical structure of human reasoning process. By that virtue, they are necessary and sufficient in guiding you to draw inference. They are commonly called the rules of inference. They include *Modus Ponens*, *Modus Tollens*, Hypothetical Syllogism, Absorption, Disjunctive Syllogism, Addition, Conjunction, Simplification, and Constructive Dilemma.

It should also be clear to you now that the violation of the basic principles of reasoning as so far discussed will result into fallacies. These fallacies could either be formal or informal as the case may be. The latter can be subdivided into fallacies of relevance and ambiguity.

8.9.2 References / Suggestion for Further Reading

Anele, D. I. (2005). *Logic and critical reasoning*. Lagos, Nigeria: Biwaz.

Anton, J. (1972). On Aristotle's principles of contradiction and its platonic antecedents. *Philosophia, 2*, 266-280.

Copi, I. M. (1982). *Introduction to logic* (5th edition). New Jersey, NJ: Prentice-Hall.

Corcoran, J. (2003). Aristotle's prior analytics and Boole's laws of thought. In *History and Philosophy of Logic*, *24*, 261 – 288.

Falaiye M. (2002). Fallacies. In E. K. Ogundowole (Ed.), *Philosophy and logic*. Lagos,

Nigeria: Concept Publications.

Leech, J. (2015). Logic and the laws of thought. *Philosophers' Imprint*, *15*,12.

Okoro C.B. (2012). Logic: Its scope and nature. In F. N Ndubuisi (Ed.), *GST 102:Philosophy,*

logic, and philosophy of science. Lagos, Nigeria: University of Lagos Press.

Priest, G. (1998). What is so bad about contradiction? In *Journal of Philosophy*, *1*, 91-130.

Waller, B. N. (1988). *Critical thinking: Consider the verdict,* New Jersey, NJ: Prentice-Hall.

Wright, P. (1971). *Valid thinking: An introduction to logic*. California, CA: Wadsworth