

UGRC 150

CRITICAL THINKING & PRACTICAL REASONING

Session 9 –DEDUCTION VS. INDUCTION(PART 2)

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Session Overview

- Deductive arguments or valid arguments may take varied forms. In this course, students will be introduced to syllogisms. Understanding of syllogisms will be good following the discussion that took place in session 8. This session continues discussions on **DEDUCTIVE ARGUMENTS** solely.

- **Goals and Objectives**

At the end of the session, the student will

1. Be able **identify and construct arguments that are syllogistic.**
2. Identify **syllogisms** as they are written with **universal negations.**
3. Familiar with **syllogistic fallacies.**

Session Outline

The key topics to be covered in the session are as follows:

- Topic One: ***UNIVERSAL AFFIRMATION, UNIVERSAL NEGATIONS AND CONDITIONAL STATEMENT.***
- Topic Two : ***THE FOUR VALID SYLLOGISMS(DEDUCTIVE ARGUMENTS).***
- Topic Three: ***SOUND ARGUMENT VS VALID ARGUMENT.***

Reading List

- Log onto the UG Sakai LMS course site://sakai.ug.edu.gh/xxxxxxxxx
- Read Unit 6 of Recommended Text –pages 112-122
- Watch ***the Videos for session 9- Deduction vs. Induction (Part 2)***
- Visit the ***Chat Room*** and discuss the ***Forum question*** for ***session 9 (Part 2)***

Topic One

UNIVERSAL AFFIRMATION, UNIVERSAL NEGATION, AND CONDITIONAL STATEMENT



UNIVERSAL AFFIRMATION AND UNIVERSAL NEGATION

UNIVERSAL AFFIRMATION

- They are statements in the form **ALL As are Bs**.
- **Examples:**
 1. All cats have claws.
 2. All snakes are poisonous.
 3. Every metal expand when heated.
 4. Every day it rains.
 5. Students cheat in exams.

UNIVERSAL NEGATION

- *They are the opposite of universal affirmation.* Their structure looks like this.
- **“No As are Bs” or “All As are not Bs”**. Examples are:
 1. No cat has claws.
 2. ALL cats do not have class.
 3. No student cheats in exams.
 4. All students do not cheat in exams.

CONDITIONAL STATEMENT

- **A conditional statement** on the other hand is any statement expressed in the form **“IF (X is an A) THEN (X is a B).”**
- **E.g1** If “you pay your school fees” then “you will be allowed to write the exams”.
- **E.g2** If “Kwame is a student of UG” then “he reads critical thinking”.
- Every conditional statement has two parts, **the antecedent** and **the consequent**.
- **The antecedent** is the condition that must occur first before the other condition or event will occur. **It is the statement that comes immediately after the “IF”.**
- **The consequent** on the other hand is the effect or condition expected to take place after the antecedent has occurred. **It is the statement that comes immediately after the “THEN”.**

CONTINUATON

THE ANTECEDENT CONDITION

- If **“you pay your school fees”** then you be allowed to write the exams.
- If **“Kwame is a student from UG”** then he reads critical thinking.
- If **“this animal is fish”** then it must have gills for breathing.
- This animal will like banana if **“it is a monkey.”**

THE CONSEQUENT CONDITION

- If you pay your school fees then **“you be allowed to write the exams.”**
- If Kwame is a student from UG then **“he reads critical thinking”**.
- If this animal is fish then **“it must have gills for breathing”**.
- **“This animal will like banana”** if it is a monkey.

Continuation

- However, **all universal affirmations and universal negations can *be expressed in the form conditional statements***.
- For instance, **“All snakes are poisonous”** can be written in a conditional sense as **“if this animal is a snake then it is poisonous”**.
- **“All students do not cheat in exams”** as a conditional statement means **“if you are a student then you do not cheat in exams”**.
- **NB: THUS all universal affirmations and universal negations have antecedents and consequents and the only way you can ascertain the antecedent and consequent is to change them in to the form of a conditional statement(if... then.....).**

Topic Two

THE FOUR VALID SYLLOGISM OR DEDUCTIVE ARGUMENTS

DEDUCTIVE ARGUMENTS

- The previous discussion will help us understand what we are about to discuss in this topic two.
- **A deductive argument is valid when the conditions or interpretation that determine the premise to be true, also ensure that the conclusion will be true as well.** That is if the premises are taken to be true the conclusion cannot be denied.
- In this topic we look at the **four different forms or patterns that a valid deductive argument can take.** Each of the patterns is a **syllogism.**

Continuation

- **A syllogism** is a deductive argument with **two premises**(the major premise and minor premise) and a **single conclusion that logically follows from the premises.**
- **E.g1** All **birds** can **fly**. (Major premise) **All Bs are Fs.**
This parrot is a **bird**. (minor premise) ===== **This is a B.**
So this parrot can **fly**. (conclusion) **SO this is an F.**
- **E.g2** All **living things** breath **oxygen**.(major premise) **All Ls are Os**
Anything that **breathes oxygen** will **die**.(minor premise)= **Any O is a D.**
So all **Living things** will **die**.(conclusion) **SO, All Ls are Ds.**
- ***NB. When it comes to syllogisms their patterns can be sketched. Look at the other side of each example and look at the patterns of each argument. The premises have something in common that guarantees the conclusion as the logical consequence.***

CONTINUATION

- The four valid syllogisms or deductive argument patterns are, **MODUS PONENS, MODUS TOLLENS, HYPOTHETICAL SYLLOGISM AND DISJUNCTIVE SYLLOGISM**
- The four types of syllogism have their **respective patterns or structure or form**. Thus the names *describe the different patterns or forms or structure* deductive arguments can take.

NB If an argument is deductive then its pattern ought to resemble anyone of the above four valid syllogisms. If not, that argument is likely not to be a valid deductive argument.

Modus ponens (affirming the antecedent)

The CORRECT PATTERN (affirming the antecedent)

The pattern is of the form,

(1) All Bs are Fs All birds can fly

This is an B => This animal is a bird

SO this is F. SO, it can fly

(2) If you work hard then *you will be rich.* *If H then R*

Mr. Erzuah works hard. => he is H

THUS, *he will be rich.* SO he is R

NB: Their patterns are the same and it ensures that they are valid.

THE INCORRECT PATTERN (fallacy of affirming the consequent)

- If we change the pattern the argument will cease to be valid.

(1) All Bs are Fs. All birds can fly

This is an F. => This animal can fly

SO this is B. SO This animal is a bird

(2) If *you work hard* then *you will be rich* *If H then R*

Mr. Erzuah is rich. => He is R

THUS, *he works hard.* THUS, he is H

NB: the pattern has changed so the argument is not be valid.

Continuation

- On page 14, the examples on the left side are valid because they represent the correct modus ponens but *those on the right side are not because they do not resemble the correct modus ponens.*
- IF we consider the first example on both sides we realize that *it is not possible for the premises of the example on the left side to be true whilst the conclusion is false. So it is valid.* But for the other example on the right side *it is possible for the conclusion to be false even when we assume the premises to be true. This is because the fact that the animal can fly does not automatically makes it a bird.* What if it is a dragon, then that will make the conclusion false.
- All this is because the patterns are not the same. The **valid modus ponens** on the left side *affirms the antecedent* but the **invalid arguments** on the Right side *affirms the consequent instead.*

Modus tollens(denying the consequent)

Correct modus tollens(denying the consequent)

The pattern looks like this,

(1) All Bs are Fs All birds can fly

This is not F => this animal cannot fly

SO, It is not B. SO, this animal is not a bird

(2) If you work hard then 'you will be rich'. IF H then R

**'Mr. Erzuah is not rich'. => He is NOT R
THUS, *he does not work hard.* THUS, He is NOT H.**

NB: *Their patterns are the same and it ensures that they are valid*

Incorrect modus tollens(denying the antecedent)

- If we change the pattern they will cease to be valid**

(1)All Bs are Fs All birds can fly

**This is not B. => this animal is not a bird
SO, It is not F. SO, this animal cannot fly.**

(2) If 'you work hard' then you will be rich. If H then R

**'Mr. ERZUAH does not => He is NOT H
work hard' THUS, HE IS NOT R
THUS, he is not rich.**

NB: the pattern has changed so they are not be valid

Continuation

- If you compare each examples on both sides on page 15. the examples on the left side are valid because they represent the correct modus tollens pattern but the other examples on the right side are not because they do not resemble the correct modus tollens pattern.
- IF we consider the first examples on both sides we realize that ***it is not possible for the premises of the example on the left side to be assumed as true and the conclusion as false. So it is valid.*** But for the other example on the right side ***it is possible for the conclusion to be false when we assume the premises to be true. This is because the fact that the animal is not a bird does not mean it cannot fly.*** What if it is a dragon, then that will make it possible to fly making the conclusion false.
- All this is because the patterns are not the same. The **valid modus tollens** on the left side ***denies the consequent*** but the **invalid arguments** on the Right side ***denies the antecedent instead***

Hypothetical syllogism

Correct hypothetical syllogism pattern

- the pattern looks like this,
(1) All **Bs** are *Fs* All **birds** can *fly*.
All *Fs* are **Es** => All *flying animals*
SO, all **Bs** are **Es** lay eggs.
SO, All **birds** lay eggs.
(2) If **you cheat** then *you will be sacked*. => if **C** then **S**
If *you are sacked* then **you won't graduate**. => If **S** then not **G**
SO, if **you cheat** then **you won't graduate**. => SO, If **C** then not **G**

Incorrect hypothetical syllogism pattern

- If we change the pattern they will cease to be valid
(1) All **Bs** are *Fs*. All **birds** can *fly*
All **Es** are *Fs* => All **egg laying**
SO , all **Bs** are **Es**. **animals can fly**
SO, All **birds** are *all egg laying animals*.
(2) If **you cheat** then *you will be sacked*.
If **you don't graduate** then *you are sacked*
SO, if **you cheat** then **you don't graduate**.
Pattern: if **C** then **S**. if not **G** then **S**. SO, if **C** then not **G**

Continuation

- On page 18, the examples on the left side are valid because they represent the correct hypothetical syllogism pattern but the other examples on the right side are invalid because they do not resemble the correct hypothetical pattern.
- IF we consider the first examples on both sides we realize that ***it is not possible for the premises of the example on the left side to be assumed as true and the conclusion as false. So it is valid.*** But for the other example on the right side ***it is possible for the conclusion to be false when we assume the premises to be true. This is because the fact that all egg laying animals can fly does not mean all birds are all egg laying animals.*** This because we have some egg laying animals that can fly but they are not birds.(dragons)

NB: OBSERVE THE PATTERNS WELL TO KNOW THE DIFFERENCE BETWEEN THE CORRECT PATTERNS AND THE INCORRECT PATTERNS.

Disjunctive syllogism

The correct pattern

- The pattern looks like this,

Either **A is true** or **B is true**(premise)

It is **not A**(premise)

SO, it is **B**. (conclusion)

- Examples:

(1) It is either **I took the book to the library** or **it is in my room**. *I cannot find the book in the library*. Therefore it must be **in my room**.

continuation

pattern: Its either **L** or **R**

It is **not L**

Therefore it is **R**.

(2). Today is **Monday** or **Sunday**.
But today is **not Sunday**. SO,
Today is Monday.

Pattern: Its either **M** or **S**

It is **not S**. SO, it is **M**.

- NB. Observe that the second premise always denies one of the alternatives in the first premise.

Topic Three

SOUND ARGUMENT VS VALID ARGUMENT.



Introduction

- So far we have discussed what **deductive arguments or valid arguments** are.
- But this ought to be distinguished from a **sound argument**. It has been observed that, **validity of an argument does not always result in true conclusions because when it comes to valid arguments the concern is about the pattern of the argument**; whether it resembles **modus ponens, or modus tollens or hypothetical syllogism or disjunctive syllogism**. It does not consider *the content or subject matter of the premises whether they are indeed true to warrant the acceptance of the conclusion as true*. Thus the term “**soundness**” has to be introduced new to emphasize **on the importance of the content or subject matter of the premises** of valid deductive arguments.

What is a Sound Argument

- A **sound argument** is an argument that is ***valid*** and also ***has all of its premises being true in reality***. That is **the subject matter of the premises are not assumed or taken to be true but rather are indeed true factual statements.**

- **Examples:**

(1) All **fish** live in **water**.(true)

All **F**s are **W**s.

Tilapia is a **fish**. (true)

=>

Tilapia is **F**.

So, tilapia lives in **water**.

So, Tilapia lives in **W**.

(2) All **human beings** breath **oxygen**.(true)

All **H**s are **O**s.

Any **oxygen breathing entity** will **die**.(true)

=> Any **O** is **D**.

So all **human beings** will **die**.

So, All **H**s are **D**s.

Continuation

(3). All **birds** can **fly**. (false)

All **Bs** are **Fs**

Superman is a **bird**. (false) =>

Superman is a **B**.

Therefore superman can **fly**.

Therefore, Superman can **F**

- From the examples above, all of them are valid. However, it is only **E.g1** and **E.g2** that are **sound arguments** because **their premises are all true in reality**. They are true facts so we can confidently believe the conclusion to be true absolutely. But **E.g3** is not sound even though it is valid because it is a modus ponens deductive argument. It is not sound because its premises are all false facts so it does not make believing the conclusion to be true absolutely guaranteed.
- **Thus when an argument is not valid and also when a valid argument contains at least one false premises then that argument will not be considered as sound argument. NB All sound arguments are valid but not all valid arguments are sound(E.g3)**