UNIT 2 CATEGORICAL SYLLOGISM

Contents:

2.0 OBJECTIVES

This unit introduces you to the essence of Aristotelian logic. Since syllogism is the most important form of inference, you ought to have a background of the nature of inference and various issues associated with it. One objective of this unit is to give a brief explanation of the nature of deductive inference and contrast it with inductive inference. Another objective is to analyze different kinds of syllogism to enable you to understand variety in syllogism.

2.1 INTRODUCTION

Categorical syllogism is the essence of traditional logic. This form of inference is called mediate inference because the conclusion is drawn from two premises. Further, this is called categorical because all propositions involved are categorical. Since syllogistic inference is nearly identical with deductive inference, an exhaustive analysis of inference is required as a prelude to a proper understanding of syllogism.

2.2 REASON AND INFERENCE: MEANING AND OBJECTIONS

Reasoning consists, essentially, in the employment of intellect, in its ability to 'see' beyond, and within as well, what is available to senses. Reasoning, therefore, is a sort of bridge which connects 'unknown' with 'known'. While reasoning is regarded so, inference is regarded as the process involved in extracting what is unknown from what is known. Reasoning is essentially a psychological process which is, undoubtedly, not the concern of logic. Therefore some logicians thought it proper to replace reasoning with inference. However, this replacement did not improve matters much. The reason is obvious. If all human beings stop thinking, then there will be nothing like inference. This dependence shows that inference is as much a psychological activity as reasoning is. What is psychological is necessarily subjective. Logic, in virtue of its close association with knowledge, has nothing to do with anything that is subjective. Therefore it was imperative for logicians to discover an escape route.

Cohen and Nagel for this particular reason chose to use 'implication' instead of 'inference'. The difference in kind can be understood easily when we look at the usage. Statements always 'imply' but do not 'infer'. Therefore implication is in the nature of relation between statements. On the other hand, I 'infer', but I do not 'imply'. This clearly shows that inference is an activity of mind. Salmon fell in line with Cohen and Nagel when he said that the very possibility of inference depends upon reasoning. Despite the fact that inference is subjective, logicians like Copi, Carnap, Russell, etc., chose to retain the word inference. But, all along, they only meant implication. Therefore keeping these restrictions in our mind let us use freely the word 'inference'.

Though the use of the word 'reason' is not much rewarding, the word 'reasonableness' has some weight. We often talk about reasonableness of the conclusion. In this context reasonableness means 'grounds of acceptability'. Surely, in this restricted sense, reasonableness is objective just as inference is.

2.3 KINDS OF INFERENCE

In a broad sense, there are two kinds of inference; deductive and inductive. Deductive inference regards the form or structure as primary and therefore it is called formal logic (inference and logic are interchangeable). It remains to be seen what form means. Inductive logic regards matter or content of argument as primary. Some logicians, like Cohen and Nagel, did not regard induction as logic at all. Without considering the merits and demerits of their arguments, let us consider briefly the characteristics of these two kinds.

Our study of formal logic begins with the distinction between truth and falsehood on the one hand, and validity and invalidity on the other. This particular distinction is very prominent. Only statements are true (or false) whereas only arguments are valid (or invalid). This distinction will take us to this table.

Table 1:

	Statements	Arguments
1)	True	Valid
2)	True	Invalid
3)	False	Valid
4)	False	Invalid

This table helps us to understand the following possibility. a) A valid argument (1 and 3) may consist of completely true statements or completely false statements. b) An invalid argument (2 and 4), similarly, may consist of statements in exactly the same manner mentioned above. It shows that truth and validity, on the one hand, and falsity and invalidity, on the other, do not coincide always. Similarly, we have to distinguish between material truth and logical truth. Material truth is what characterizes matter of fact. Logical truth is determined by the structure of argument. We shall consider examples which correspond to four combinations (see table1). Let us call premises p1, p2, etc. and conclusion q.

Arg1:

p1 : No foreigners are voters.

p2 : All Europeans are foreigners.

q : ∴ No Europeans are voters.

Arg2:

p1 : Some poets are literary figures.

p2 : All play writers are literary figures.

q : ∴ Some play writers are poets.

Arg3:

p1 : All politicians are ministers.

p2 : Medha Patkar is a politician.

q : ∴ Medha Patkar is a minister.

Arg4:

p1 : 3 is the cube root of 27.

p2 : 27 is the cube root of 729.

q : ∴ 3 is the cube root of 729.

These four arguments apply to arguments 1, 2, 3, and 4 of Table 1 respectively. First and third arguments have a definite structure in virtue of which they are held to be valid. Second and fourth arguments have a different structure which makes them invalid. When an argument is valid, the premise or premises imply the conclusion. If there is no implication, then the argument is invalid. Validity is governed by a certain rule which is represented in a tabular form. [Let us designate 'true' by '1' and 'false' by '0' as a matter convention].

	p	q	
1)	T(1)	T(1)	Valid
2)	F(0)	F(0)	Valid
3)	F(0)	T(1)	Valid
4)	T(1)	F(0)	Invalid

We can also say that the premises necessitate the conclusion and when they necessitate the conclusion there is implication. In this case, necessity is of a particular kind, viz., logical necessity. Therefore, when there is implication, conclusion is necessarily true and *vice versa*. Very often, deductive logic is identified with mathematical model. It is generally admitted that in both these disciplines information provided by the conclusion is the same as the one provided by the premises. It means that both are characterized by material identity. Deductive logic, therefore, is an example for tautology. This characterization is highly significant and is in need of some elaboration.

If, one can ask, the conclusion does not go beyond premises (it may go below or well within) and no new information is acquired in the process, then why argue and what is the use of arguments? The answer is very simple. Knowledge is not the same as mere acquisition of information. In other words novelty is not a measure of knowledge. The legend is that Socrates extracted a geometrical theorem from a slave purported to be totally ignorant of mathematics. The moral is that knowledge is within, not in the sense in which brain or liver is within. Knowledge is the outcome of critical attitude. It is discovered, not invented and so goes an ancient Indian maxim: eliminate ignorance and become enlightened. If what is said is not clear, then consider this path. Deductive argument helps us to know what is latent in the premises, i.e., the meaning of the premises. It is an excursion into the analysis of their meaning or meanings. And the conclusion is an expression of the same. If so, it is easy to see

how the denial of the conclusion in such a case amounts to denying the meaning or meanings of the premises which were accepted earlier. What is called self-contradiction is exactly the same as the combination of the denial of the conclusion and the acceptance of the premises. Therefore we say that a valid deductive argument is characterized by logical necessity. If so a deductive argument is always true. This is the meaning of tautology.

At this stage, two terms are introduced: analytic and a priori. Consider this example: 'all men with no hair on their heads are bald'. We know that this statement is true in virtue of the meaning of the word 'bald'; not otherwise. Such a statement is called analytic. In such statements the predicate term (here 'bald') is contained in the subject term (here 'men with no hair on their heads'). Knowledge obtained from an analytic statement is necessarily a priori, meaning knowledge prior to sense experience. In philosophical parlance, all analytic statements are necessarily a priori. Deductive logic provides knowledge a priori, though the premises and the conclusion considered independently are not analytic. It is the knowledge of the relation between the premises and the conclusion which is a priori. Therefore deductive argument and analytic statement share a common characteristic; in both the cases the denial leads to self-contradiction.

How can we say that deductive logic provides a priori knowledge? Consider an example.

Arg. 5: All saints are pious.

All philosophers are saints.

∴ All philosophers are pious.

Evidently, there is no need to examine saints and philosophers to know that the conclusion is true. Indeed, it is not even necessary that there should be saints who are pious as well as philosophers. This being the case, arg. 5 takes the following form without leading to any distortion of meaning.

Arg. 5a: If all saints are pious and all philosophers are saints, then all philosophers are pious.

The argument is transformed into a statement which involves relation. Implication (the present relation is one such) is such that without the aid of sense experience, but with the laws of formal logic alone, it enables us to derive the conclusion. Thus like an analytic statement, a valid deductive argument provides a priori knowledge and hence it is devoid of novelty. It is this sort of relation that precisely describes the relation between the premises and the conclusion in deductive inference. This does not mean that deductive argument is absolutely certain. This is because necessity is a logical property whereas certainty is a psychological state. The former is objective and the latter is subjective.

When sense experience takes back seat, reason becomes the prime means of acquiring knowledge. Following the footsteps of Descartes, who is regarded as the father of rationalism, we can conclude, somewhat loosely, that deductive logic is rational. So we have sketched three characteristics; logical necessity, a priori and rational. There is a thread which runs through these characteristics. Therefore one character presupposes another.

Deductive argument is characterized by qualitative difference in opposition to quantitative difference, i.e. the difference between valid and invalid arguments is only in kind but not in degree. Further, validity is not a matter of degree. Let us make

matters clear: a valid argument cannot become more valid in virtue of the addition of premise or premises. On the other hand, if any one premise is taken out of a valid argument, then the argument does not become 'less valid'; it simply becomes invalid. So an argument is either valid or invalid. A valid argument is always satiated. In other words, the premises in a valid argument constitute the necessary and sufficient conditions to accept the conclusion. An argument is invalid due to a 'missing link' in the class of premises. Deductive argument, therefore, is regarded as demonstrative argument. Acceptance of premises leaves no room for any reasonable or meaningful doubt.

We have learnt that validity is an important facet of deductive logic. Any account of validity is incomplete without considering Strawson's analysis of the nature of deductive logic. Strawson lists three aspects of formal logic: generality, form and system. Generality is distinguishable, clearly, from matter. Generality means that individual is not the subject matter of logic. Formal logic concerns only with the relation between statements, but not objects. It is futile to embark upon a study involving objects because such a study has only beginning but no end. Consider two examples,

Arg. 6:

p1 : The author of Abhijnana Shakuntala was in the court of king Bhoja.

p2 : Kalidasa is the author of Abhijnana Shakuntala.

q : ∴ Kalidasa was in the court of king Bhoja.

Arg. 7:

p1 : The author of Monadology was in the court of the queen of Prussia.

p2 : Leibniz is the author of Monadology.

q : ∴ Leibniz was in the court of the queen of Prussia.

It is easy to decide prima facie that the structure of these arguments is identical. The difference consists in subject matter only and it is possible to construct, at least theoretically, countless arguments having an identical structure. Obviously, this is not a profitable exercise. The essence of formal logic consists in saying that p1 & p2 together imply q or that q follows from or entails p1 and p2 together. Only implication and entailment are relevant here. Strawson has made this aspect very clear. Implication or entailment is independent of subject matter. Therefore it is impossible to identify the subject matter in virtue of recognition of implication. This point can be further clarified with the help of variables. Let us represent Abhijnana Shakunthala or Monadology with x, Kalidasa or Leibniz with y and queen of Prussia or King Bhoja with z. Now the argument takes this form.

Arg 7a : p1 : The author of x was in the court of z.

p2 : y is the author of x.

q : ∴ y was in the court of z.

In this particular context, without knowing the contents of x, y, and z we can know that p1 and p2 together imply q. Therefore it is possible to determine the validity or invalidity of an argument without knowing the contents of the argument.

Let us call such forms logical forms. A logical form has two components: variables and constants. x, y, z etc are variables. In the case of categorical proposition the words *all, some, no* and *not* are constants. In the final analysis, the structure of an

argument is determined by constants, but not variables. The dependence of the laws of an argument on constants is illustrated in this way. In life science the classification of animals is an important topic. The anatomical features of birds and aquatic creatures differ and there is difference in the function of those organs. Just as birds have some organs in common, aquatic creatures have certain other organs in common. These common organs correspond to constants and individual creatures correspond to variables. Similarly, every class of argument has definite constants. Just as the structure of birds is different from the structure of aquatic creatures, the structure of one class of arguments is different from the structure of some other class of arguments. The laws which explain the function of the organs of birds are different from the laws which explain the function of the organs of aquatic creatures. Similarly, in the case of arguments when the structure of an argument differs from that of another, the corresponding laws also differ from one another.

Integration of rules is another characteristic of formal logic. The structures of argument and rules are mutually dependent. If it is possible to decide the structure of an argument and also different classes of arguments, then is possible to achieve what is called formalization or systematization because formalization enables us to make a complete list of rules and also classify them so as to correlate them with respective arguments..

On the contrary, induction, in the first place, stands for any non-demonstrative argument where the premises, irrespective of their number, do not and cannot constitute conclusive evidences for the conclusion. The word 'induction' is the translation of what Aristotle called 'epagoge'. C.S. Peirce used the term 'ampliative' for epagoge because in this type of argument the conclusion always goes beyond the premises and the premises offer, at best, reasonable grounds to 'believe' such conclusion. Belief is not the same as proof, a distinction which was, more often than not, completely ignored by the protagonists of induction. Nor is it a measure of proof. This is one difference. Secondly, uncertainty and sense experience characterize inductive argument. Let us consider the latter first. Inductive inference begins with sense experience. The premises, therefore, can be called 'observation-statements' which directly result from experience. However, the conclusion is not an observation-statement because it overshoots the material provided by observation– statements, which is why they cannot justify the conclusion. No matter how many black crows I have seen, they cannot prove that 'all crows are black.'

At the stage, it is necessary to dispel a widespread and deep-rooted misconception. It is claimed erroneously that inductive argument always produces universal statement. On the contrary, what it provides is a statement which simply depends upon experience for further verification, but in itself is not an experiential statement. On some occasions, experience vouches for the conclusion, but on some other occasions, it does not. For example, considering the fact that, today I observed 5384 black crows, I may conclude that 'tomorrow I will observe the same number of black crows'. This type of conclusion is characterized by a sort of leap, leap from 'observed to unobserved or unobservable'. This is called inductive leap or simply generalization. But this is not a universal statement as understood by traditional logic. It shows that induction is just inconceivable in the absence of generalization though universal proposition is not necessary for an inference to become inductive. It is possible to construct a universal statement within the limits of sense experience without involving generalization, for example, when I conclude after close scrutiny that every book in the library is a hardback edition. This has nothing to do with induction. Therefore inductive inference may or may not yield universal proposition though it has to yield necessarily generalization.

The examples considered above are future-oriented and in principle, they are verifiable. However, inductive inference need not be so always. It can also be past-oriented which is surely, 'unverifiable'. History, Anthropology, Geology, etc. consist of arguments which are past-oriented. But the mechanism, involved in both the cases is exactly the same. Therefore the prime characteristic of induction is that the conclusion does not necessarily follow from the premises and that experience precedes inference which means that inductive inference is dubitable and *a posteriori*. Whatever knowledge we acquire 'after experience', or whatever depends upon experience is called *a posteriori* as opposed to a priori.

Uncertainty or dubious nature and a posteriori knowledge provided by inductive logic entitle it to be called empirical- again loosely- a characteristic disputed by Popper. The uncertainty of inductive conclusion brought in another term basic to the philosophy of science, viz. 'probability'. According to some inductivists all inductive conclusions are only probable. It is important to distinguish validity and probability. As mentioned earlier, validity is not a matter of degree, whereas probability is a matter of degree. Therefore an inductive inference may be less probable or highly probable.

2.4 DEDUCTIVE REASONING AND SYLLOGISM

In Aristotelian sense, syllogism is the kind of logical form to which every deductive inference is reducible. On most of the occasions, when people reason, they reason in methods in which some logical pattern runs as undercurrent. It is only logicians who discover these undercurrents because they are capable of critical examination of these undercurrents. The so-called logical pattern is extracted from a lay-man's method. A system is evolved by formalizing apparently disparate arguments. The difference in these methods is clearly perceptible. The difference is that a logician determines the standard-form which such argument or arguments take whereas a lay-man is unaware of such standard-form. A logician's method generalizes various arguments and it helps in discovering the common form to which all such arguments subscribe. It is important remember that the process of generalization is an important characteristic of formal logic. Otherwise, logic will be looked upon as a mere rhetoric and therefore with no practical value. If this is the way logic is evaluated, then anyone will conclude that it is far removed from the way people, as a matter of fact, talk and argue which is, no doubt, far from truth.

Logical analysis of syllogism

To make clear what we have just said, let us contrast these methods.

A) Lay-man's method: 'Does God exist? Of course, he does not! No one has ever seen him, heard him, talked to him; has any one?'

B) Logician's method:

Arg. 8:	All bodies which exist are perceivable.	B A P
	God is not perceivable.	G E P
	∴ God is not a body which exists.	∴ G E B

A) Lay-man's method: 'Was the Neanderthal a man? Yes he was. In fact we have proof to assert that he made tools, could paint, lived in groups etc.'

B) Logician's method:

Arg. 9: All beings who make tools, can paint,
live in groups, etc. are men. B A M
The Neanderthal was a being who made tools,
could paint, lived in groups, etc. N A B
∴ The Neanderthal was a man. NAM

What do we notice in these arguments? We notice that these arguments consist of three propositions (each with an S and a P). The statement to be proved is found in the last place in *logical sense*, and hence its technical name is 'conclusion'; the other two propositions function as reasons. Hence their logical name is 'premise'. Premises are found at the very beginning, again in *logical sense.* The order of the statements, therefore, is immaterial. Suppose that the conclusion appears at the end, as it happens generally. Then the conclusion is immediately preceded by words like *therefore, as a result, hence, consequently,* etc. It indicates that the 'consequentia' (the inference itself, as distinct from the 'consequence' which is another word for 'conclusion') is valid. The conclusion can as well appear at the very beginning in which case it is immediately succeeded by words like *because, for* etc. Any of these words in italics functions as a bridge connecting the premises with the conclusion. Further, we notice that at least one evidence is in the form of general principle which is invariably a universal proposition ('For somebody to exist….. in the first example and 'A man is one…' in the second example) and also that it is applied it to a particular case. Consequently, syllogism is invalid in the absence of universal proposition.

A close look at arguments considered above reveals an interesting aspect. Though there are three propositions, there are only three terms. Each term occurs twice in the arguments. These terms are named as follows. S and P of the conclusion are called the minor term (S) (or simply minor) and major term (P) (or simply major) respectively. The premise in which the minor occurs is called the minor premise and the premise in which the major occurs is called the major premise. One term is common to both the premises. This is called the middle term (M). In the first example 'God' is minor , 'bodies which exist' is major and 'perceivable' is middle and in the second example 'Neanderthal' is minor, 'man' is major and 'beings who…groups' is middle. Again, order of premises does not matter though, generally, major finds the first place.

Aristotle had convincing reason to choose these names. While the major has maximum extension, minor has minimum extension. The middle is so called because its extension varies between the limits set by the minor and the major. Aristotle argued that our inference proceeds from minor to major through middle. This explains the meaning of mediate inference.

Check Your Progress I

Note: Use the space for your answers.

1) Compare and contrast deduction and induction..

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2) In a syllogism how do you relate the major, minor and middle terms?

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2.5 KINDS OF SYLLOGISM

Syllogism is a class name with several subclasses. The classification is determined by constants. The types of constants vary from one class of syllogism to another class. Categorical syllogism is an important subclass. In this subclass propositions with their constituent terms are variables and quality and quantity of propositions are constants. Variables, i.e., propositions and their constituent terms do not determine the logical status, i.e., validity or invalidity of arguments because change of propositions does not affect the logical status as long as quality and quantity remain the same. Only the latter determine the logical status of arguments. This is an important aspect of formal logic. Let us first assume that every letter stands for a unique term and then examine the following arguments.

1) **Categorical syllogism:**

10.	11.	12.
All X are Y.	All P are Q.	All M are N.
All Y are Z.	All Q are S.	All N are O.
∴ All X are Z.	∴ All P are S.	∴ All M are O.

The logical status of 10, 11, and12 remains unchanged though terms differ. If terms are different, then propositions also are different. In these arguments 'All' and 'are' are constants. Suppose that 'All' is replaced 'No' in both the premises of 10. Then the argument becomes invalid though variables remain unchanged. Even when the argument remains valid, its structure may vary. This will become evident in the following example.

Arg.13: Some X are Y.

All Y are Z.

∴ Some X are Z.

The structure of 10 and 13 are different. It shows that the axioms which determine the logical status of syllogism deal with quantity and quality of propositions and in turn distribution of terms. 'Some' and 'not' are other constants. Constants mentioned above determine the structure of categorical syllogism.

Before we turn to other subclass of syllogism called conditional syllogism we should consider an important aspect. Modern logic makes a distinct classification of propositions; simple, general and compound. If a grammatical sentence expresses one and only one proposition, then it is simple. Categorical proposition is called general in modern logic and conditional proposition, which is called compound in modern logic, is a combination of two or more than two propositions of any kind.

Those propositions which constitute a compound proposition are components of such proposition. Several propositions are compounded using constants. Each constant determines the species which belongs to this subclass. Let us restrict ourselves to conditional syllogism and postpone further discussion of categorical syllogism to a later stage.

There are three kinds of conditional syllogisms which are discussed briefly.

2) **Pure Hypothetical Syllogism (P. H. S.):** In this subclass of syllogism all propositions are hypothetical. They are called hypothetical because they express a condition. The words *if …. then* constitute the condition and also constant because in the absence of this particular constant the proposition ceases to be hypothetical. The statement which appears immediately after *if* is called antecedent and the statement which appears immediately after *then* is called consequent. P. H. S. is governed by one rule which says that one statement must be common to two premises. If quality is constant, then it should appear in one premise as antecedent and in another as consequent. The common statement can appear as antecedent in one and as consequent in another provided it is affirmative in one and negative in another. In the latter case the conclusion becomes negative.

   P. H. S. is illustrated below.

   Arg.14: If this party wins, then we shall have a good government. If A, then C.
   If we shall have a good government, then we shall prosper. If C, then B.
   ∴ If this party wins, then we will prosper. ∴ If A, then B.

   A and C constitute the components of the first premise, C and B constitute the components of second and A and B constitute the components of the conclusion.

3) **Mixed Hypothetical Syllogism (M. H. S.):** If the major premise (usually the first one) alone is hypothetical, then the syllogism is called M. H. S.. Second premise and the conclusion are simple or general. M. H. S. is illustrated below.

Arg. 15: If I do my duty, then I shall be happy. If A, then B.
I do my duty. A
∴ I shall be happy. ∴ B

In these kinds, there is no 'middle term'. However, middle term is replaced by a proposition which is common to both the premises. In 14 'we shall have a good government' is common to both the premises and in 15 'I do my duty' is common to both the premises. Hence we shall introduce a new word; middle proposition. An important limitation should be noted at this stage itself. It is fallacious to affirm B, in the minor premise instead of A and thereby affirm A in the conclusion instead of B. It is a fallacy because it violates a rule of M. H. S. which states that antecedent and consequent must be affirmed in the minor and the conclusion respectively. The only legitimate alternative is to deny the consequent and the antecedent in the minor and the conclusion respectively. In terms of prohibition it only means that the consequent and the antecedent should not be affirmed in the minor and the conclusion respectively. When antecedent and consequent are affirmed in the legitimate manner, the structure (technically known as mood) of the argument is identified as *Modus Ponendo Ponens* (in brief *Modus Ponens*). When the consequent and the antecedent are denied in the minor and the conclusion respectively, then the structure is identified as *Modus Tollendo Tollens* (in brief *Modus Tollens*). When we undertake a study of symbolic logic, we will come to know the importance of these moods which are called the Rules of Inference. If antecedent is denied in the minor instead of affirming, then the

fallacy committed is called the *fallacy of denying the antecedent*. If the consequent is affirmed in the minor instead of denying, then the fallacy committed is called, the *fallacy of affirming the consequent*. *Modus Ponendo Ponens* is illustrated by Arg. 15: The rest of the structures (both valid and invalid) are given below.

Modus Tollendo Tollens

Arg. 16: If C, then D.
not-D
∴ not-C

Fallacy of denying the antecedent

Arg. 17: If E, then F.
not- E.
∴ not-F.

Fallacy of affirming the consequent

18 If G, then H.
H.
∴ G.

4) **Disjunctive Syllogism (D.S.):** In this subclass of syllogism the major premise (usually the first one) expresses alternatives connected by connectives, '*either… or*'. So they are constants too. Such a proposition is called disjunctive proposition. In disjunctive proposition the connective *either* is implicit many times. Therefore its presence or absence does not alter the structure of the proposition. Second premise and the conclusion are simple or general. In D.S. itself there are two types. While regarding these two types the emphasis is on the connective *or* because as mentioned above *either* is implicit many times. One use of *or* is called inclusive and another is called exclusive. *Or* is used in inclusive sense if both alternatives are admissible and it is used in exclusive sense when the alternatives are mutually exclusive and totally exhaustive and the acceptance of one alternative excludes the other. In the proposition 'either he is stupid or stubborn' *or* is used in inclusive sense because the same person may be both stupid and stubborn. However, in the proposition 'either he is generous or miser' *or* is used in exclusive sense because no one can be both generous and miser at the same time. In order to bring both usages under one class a rule is devised which says that one of the alternatives must be denied in the minor so that the remaining alternative is affirmed in the conclusion. The following argument illustrates the explanation.

Arg. 19: Either he is stupid or stubborn.
He is not stupid.
∴ He is stubborn.

Either A or B .
Not A.
∴ B.

Here again there is no middle term. However, one component (A) appears in the first premise in affirmative mode and in the second in negative mode. This occurrence corresponds to the affirmative mode of common component in one premise and its negative mode in another in PHS. A disjunctive argument with this structure is identified as *Modus Tollendo Ponens*.

In a disjunctive proposition the components are commutable, i.e., 'either A or B' means the same as 'either B or A'. Therefore in the minor premise any component can be denied. Affirming of a component in the minor premise is not permissible. If this rule is violated, then the fallacy committed is called the *fallacy of Modus Ponendo Tollens*. The following example illustrates this fallacy.

Arg. 20: Either I or J

I
∴ not-J

However, this is not a fallacy if the alternatives are mutually exclusive and totally exhaustive.

Check Your Progress II

Note: Use the space provided for your answer.

1) Describe the structure of Pure Hypothetical Syllogism with an example.

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2) Describe the structure of Disjunctive Syllogism with an example.

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2.6 LET US SUM UP

Inference and implication are the essence of logic. Inference is psychological and implication is logical. Deduction and induction are two forms of logic. Deduction is formal and induction is material. Logical necessity characterizes the former and uncertainty characterizes the latter. Categorical syllogism, P. H. S., M. H. S. and D.S. are the kinds of syllogism accepted by traditional logic.

2.7 KEY WORDS

Inference : It is an operation of reason by which from some known truth we arrive at unknown truth.

Major term : The term occurring in the predicate of the conclusion in a categorical syllogism.

Middle term : The term occurring in both the major and the minor premises of a standard-form categorical syllogism.

Minor term : is the subject of the conclusion.

Major premise : The premise of a categorical syllogism that contains an instance of the major term and in conditional syllogism the conditional proposition.

Minor premise : The premise of a categorical syllogism that contains the minor term.

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