BPYC-133

Block 2

TRADITIONAL LOGIC

Block 2 “Traditional Logic” comprised of six units, tries to present the various aspects of traditional logic; categorical proposition, quality, the quantity of a proposition, and distribution of terms, informal fallacies, square of opposition, existential import. This block also discusses the methods to translate ordinary language statements into standard-form categorical propositions. These discussions will enable learners to understand the difference and relation between traditional and modern development of logic and the relation between our day to day language and logical language and also why there is a shift from ordinary language to ideal language and the need and significance of special kind of language into the realm of logic.

Unit 5 “Categorical Proposition” aims to understand the nature of categorical propositions; the fundamental unit of a categorical syllogism. In this unit, the learner will find the discussion on the difference between sentence and proposition, categorical propositions and the types of propositions in classical and modern logic, four kinds of categorical propositions and the structure of standard form categorical proposition.

Unit 6 “Quality, Quantity, and Distribution” aims to develop a clear understanding of the structure of a standard form categorical proposition. This unit discusses two essential attributes of a categorical proposition: Quality and Quantity; the meaning of ‘term’ and its various kinds; ‘distribution of terms’ depending on the quality and quantity in a standard form categorical proposition.

Unit 7 “Translating Categorical Proposition into Standard Form” aims to present the methods to translate ordinary Language statements into standard-form categorical proposition. This unit discusses, arranging standards from ingredients in order; translating terms without nouns by replacing them with plural nouns or pronouns; non-standard verbs to be replaced with standard copula; translating Singular Propositions; translating Categorical propositions whose Quantities are indicated by words other than the standard form quantifiers “All” “No” and “Some”; translating Categorical Propositions which carry words which designate quantity more specifically than standard from propositions; translating Categorical Propositions which do not carry any words at all to indicate quantity; translating propositions which do not resemble standard form Categorical Propositions but can be translated into them; translating Exceptive Propositions; translating Exclusive Propositions; translating Adverbs and Pronouns; translating Conditional Statements.

Unit 8 “Square of Opposition and Existential Import” aims to understand the relations of opposition between the four standard-form categorical propositions by the medium of traditional square of opposition as given by Aristotle. This unit tries to present four relations as presented by Aristotle; namely, Contradictories, Contraries, Subcontraries and Subalternation. The unit also discusses the contribution made by George Boole to resolve the inconsistencies that arose in the traditional square of opposition after the introduction of the concept of existential import.

Unit 9 “Immediate Inference” discusses the immediate inference; Conversion, Obversion and Contraposition. This unit tries to elaborate to study immediate inferences of Conversion, Obversion and Contraposition for all the four standard form categorical propositions.

Unit 10 "Introduction to Fallacies" introduces the logical fallacies emerged in argumentation. The main focus is on informal fallacies, emerged in informal logic. The unit discusses the four main kinds of informal fallacies; Fallacies of Ambiguity, Fallacies of Relevance, Fallacies of Defective Induction and Fallacies of Presumption, and their sub-categories.

UNIT 5 CATEGORICAL PROPOSITIONS*

Structure

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5.0 OBJECTIVES

This unit has the objective of understanding the nature of categorical propositions; the fundamental unit of a categorical syllogism. At the end of the unit the learner will enable to understand,

- the difference between sentence and proposition,
- categorical propositions and the types of propositions in classical and modern logic.
- four kinds of categorical propositions and the structure of standard form categorical proposition.

5.1 INTRODUCTION

The theory of categorical propositions takes the central position in Logic. It was given by Aristotle more than 2000 years ago. The importance of this contribution lasts even today as in our day to day ordinary life we either use categorical propositions or sentences, which are easily translatable into categorical propositions. Categorical propositions are the building blocks or constituents of a categorical syllogism; the fundamental form of argument used in human reasoning. Logical reasoning is concerned with constructing arguments, analyzing the structure of arguments and evaluating them to check whether they are valid or invalid. All arguments are built with propositions. Let us begin the unit by examining the concept of a proposition.

5.2 PROPOSITION

In logic the unit of reasoning is called proposition. A proposition is either asserted or denied. Both premises and conclusion in an argument are propositions. Proposition is a declarative statement of facts, which asserts that something is (or is not) the case, and therefore it is either true or false. For example, ‘Dogs are mammals’, ‘Pigeons are birds’, ‘Knives are sharp objects’ etc. It is important to distinguish a proposition from a sentence. Sentence is a grammatical unit expressed in any particular language. A proposition is different from imperative, exclamatory or interrogative sentences. Although questions are asked, commands are given and exclamations are uttered but unlike a proposition they cannot be asserted or denied. Truth and falsity are applied to propositions and do not apply to questions, commands and exclamations. Although interrogative sentences are in the form of a question, like, Did Rohan come to class today?, Will you have lunch with me today? which can be answered in either yes or no but they are neither true nor false. Similarly, imperative sentences are in the form of a command, like, Give me a glass of water! Open the door! which can neither be true nor false. Moreover, exclamatory sentences, like, Hurray! we won the match, Wow! that was a great song and others can neither be true nor false. It is significant to note that an essential feature of being a proposition is that it is either true or false. Only informative, declarative and factual sentences are propositions. However, we might not know about the truth or falsity of a given proposition. A proposition is true when it describes the facts correctly and false when it does not. For example, although at present, due to limited research, we are unaware about the truth or falsity of the proposition, 'The corona virus is curable' but it is certain that either it is true i.e. there is a cure for the virus or it is false i.e. the virus is incurable.

Furthermore, two sentences can be used to assert or deny the same proposition. Given the same context, two sentences, which are composed of different words and arranged differently, have the same meaning. We take two sentences;

Playing hockey is known to Sushma.

Sushma knows to play hockey.

These two declarative sentences have exactly the same meaning despite being two different sentences on several counts, like, first contains 6 words and second contains 5 words, they begin with different words etc. Also, the same sentence can be used in different contexts to make very different statements. On change in the temporal context the same sentence can give rise to different propositions. Propositions may be simple as well as compound. Moreover, a sentence is a sentence in the particular language in which it is used. However, Propositions are not peculiar to any language. A given proposition can be asserted in many languages. For example;

It is snowing. (English)

Il neige. (French)

பனி பொழிகிறது (Tamil)

برف باري ٿي رهي آ (Sindhi)

बर्फ गिर रही है| (Hindi)

All the five sentences in English, French, Tamil, Sindhi and Hindi languages mentioned above are certainly different as they are sentences in different languages. Still they have the same meaning and are uttered to assert the same proposition “It is snowing.” Also, the composition of same words can be used to assert different propositions at different times. Some writers prefer the word “statement” instead of “proposition.” However, for our purpose we shall use the term “proposition.”

Historically, in order to provide us with techniques to discriminate between valid and invalid arguments two types of theories have been developed.

1. “Classical” or “Aristotelian Logic”
2. “Modern” or “Modern Symbolic Logic”

5.2.1 “Classical” or “Aristotelian Logic”

Classical Logic is named after Aristotle, the ancient Greek philosopher. Aristotle has contributed to nearly all fields of human knowledge. He is known as the founder of logic and one of the first scholars to systematically study propositions and arguments. His works on reasoning are gathered under the name *Organon*. *Organon* contains the subject matter of Classical Logic. In the present block and unit we shall develop an understanding of Classical Logic.

5.3 CONCEPT OF PROPOSITION IN CLASSICAL LOGIC

Propositions are building blocks of every argument. A proposition carries a subject term, a predicate term and a copula. For example, in the proposition “Cats are mammals”, ‘Cats’ is subject, ‘mammals’ is predicate and ‘is’ is copula. On the basis of truth value there are three kinds of propositions. A proposition which is always true is a called **tautology**. For example, “Men are mortal”, “No squares are circles”, “Dogs are mammals” etc. A proposition which is always false is called **contradictory** or self contradictory. For example, “Men are immortal”, “Hydrogen is Nitrogen”, “All triangles are circles” etc. A proposition which does not have a fixed truth value, i.e. is true in some case and false in some others, is called **contingent**. For example, “It is cold”, “Ram is the most intelligent boy in the town”, might be true right now but they may be false at a different time.

Traditionally, philosophers have divided propositions into two groups:

1. Categorical Propositions
2. Conditional Propositions

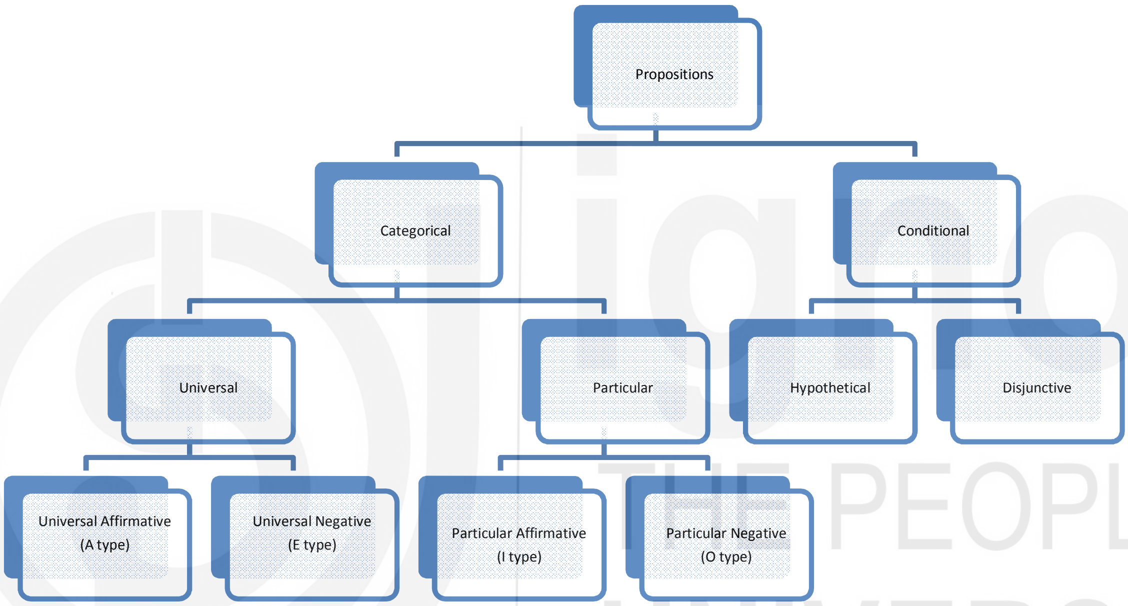


Figure1: Traditional Classification of Propositions (Jain, 2014, p.37)

Categorical propositions are subject of our discussion in the present unit. We shall briefly explain conditional propositions i.e. Hypothetical propositions and Disjunctive propositions in the modern classification of propositions.

5.4 CONCEPT OF A PROPOSITION IN MODERN LOGIC

Modern Logic has its origin in the first half of the nineteenth century. Unlike traditional Logic, Modern logicians move beyond the traditional methods, principles and rules of deriving validity and invalidity of an argument. George Boole, Alferd North Whitehead, Bertrand Russell are prominent Modern Logicians. Modern Logic is used to test the validity of all variety of arguments. Its methods are used in computers, electric switching circuits, artificial intelligence and other modern day technology. The modern logicians broadly accept the traditional account of propositions but their classification is different from them. This difference is due to existential import of the propositions. We shall study the concept of existential import in a separate unit of this block. Modern logicians have given the following classification of propositions:

1. Categorical Propositions
   A. Singular (simple)
   B. General
2. Compound Propositions

5.4.1 Categorical Propositions

5.4.1.1 Singular Propositions: A categorical proposition is singular when the subject term of the proposition is a proper name or one specific individual or object. Few examples are, "Raman is student of this College", "Himalayas are the highest mountain ranges in the world", "Gita is daughter of Lakshmi" etc.

5.4.1.2 General Propositions: In case of a general proposition the subject refers either to all members of a class or to some members of a class. There are two types of generalizations; either universal or particular. In the next section on categorical proposition we will see universal and particular propositions can be of two types depending on whether they affirm or deny the case (refer to fig.2) Traditional logicians add general propositions under universal propositions without ascribing any special status to them. However, singular propositions are neither universal nor particular but they have a unique status.

Furthermore, traditionally logicians, like, Aristotle have recognized that there is only one form of categorical proposition i.e. "Subject-Predicate form" (form which ascribes predicate to a subject). However, apart from this other relations can exist between subject and predicate of a singular proposition. Let us take few examples:

1. Raman is a hardworking student.
2. Raman is daughter of Lakshmi.
3. Raman is younger sister of Shubham.

According to modern logicians the first proposition has “subject-predicate form.” “Raman” is the subject and the predicate “a hard working student” is ascribed to him. The other two propositions are relational propositions i.e. they state that the two things have a certain relation with each other. In the second, Raman and Lakshmi have daughter-mother relation with each other. In the third, Raman and Shubham are related as sister and brother with each other. These relational propositions can never be reduced to subject-predicate propositions and are fundamentally different from them.

5.4.2 Compound Propositions

A compound proposition is constructed by two or more categorical propositions. Compound propositions are of three kinds:

5.4.2.1 Conjunctive Propositions: Two categorical propositions joined by ‘and’ give rise to conjunctive proposition. For example, “Krishna is polite and intelligent”, “Rekha is curious and funny” etc.

5.4.2.2 Disjunctive Propositions: When two categorical propositions are joined by the relation of ‘either or’ then it is called disjunctive proposition. For example, “Either Ram is in class or he is in the medical room”, “Either I will have apple or I will have banana” etc.

5.4.2.3 Hypothetical Propositions: When two categorical propositions are joined by ‘if then’ relation then they produce a hypothetical proposition. For example, “If I get this job then I can buy a car”, “If we go out then we can go mountain climbing” etc. (Jain, 2014, p.61-63)

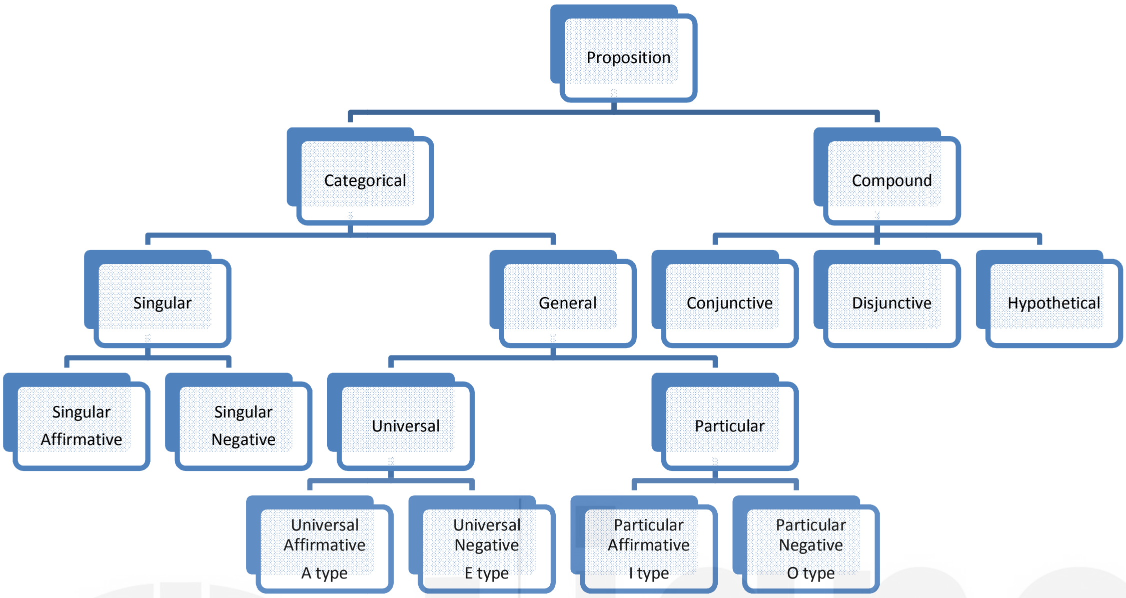


Figure 2: Modern Classification of Propositions (Jain, 2014, p.63)

Check your Progress I

Note: a) Use the space provided for your answer.

b) Check your answers with those provided at the end of the unit.

1. Write a note on the following:

   a) Modern categorization of propositions

5.5 CATEGORICAL PROPOSITIONS

In Classical or Aristotelian logic the deductive reasoning focuses on analyzing arguments which carry propositions of a distinct variety, namely, categorical propositions. Categorical propositions are building blocks of classical theory of deduction as they are fundamental units which form a Categorical syllogism. A Categorical proposition is a proposition which relates to classes or categories. These classes are denoted by subject terms and predicate terms. **Class** is understood as a collection of all objects that have a common specific characteristic. Categorical propositions either affirm or deny, that all or part of the class denoted by the subject term S is included in or excluded from the class denoted by the predicate term P. Let us take example of an argument to understand the relation between subject and predicate terms in categorical propositions:

All philosophers are scientists.
Some philosophers are mathematicians.
Therefore, some mathematicians are scientists.

All three propositions used in this argument, both premises and conclusion are categorical propositions. All three categorical propositions are about classes; class of all philosophers, class of some mathematicians and class of some scientists. The first proposition asserts that the entire class of philosophers is included in the class of scientists. The second proposition asserts that some members of the class of philosophers are also members of the class of mathematicians. The third proposition asserts that some members of the class of mathematicians are also members of the class of scientists.

Introduction to Logic identifies three ways in which classes may be related to one another.

1. If every member of one class is also a member of a second class, like the class of lizards and the class of reptiles, then the first class is said to be included or contained in the second.
2. If the two classes have no members in common, like the class of all buildings and the class of all plants, the two classes may be said to exclude one another.
3. If some members but not all of them are also members of another, like the class of hockey players and class of athletes, then the first class may be said to be partially contained in the second class. (Copi et al., 2016, p.101)

All these various relationships between classes are affirmed or denied by categorical propositions. Based on these relationships we have exactly four types of categorical propositions.

5.6 THE FOUR KINDS OF STANDARD FORM CATEGORICAL PROPOSITIONS

A standard form categorical proposition expresses the relation between the two classes with complete clarity. For a categorical proposition to be in standard form it has to be a substitution instance of one of the four forms given below:

1. Universal Affirmative Proposition: All S are P.
2. Universal Negative Proposition: No S is P.
3. Particular Affirmative Proposition: Some S is P.
4. Particular Negative Proposition: Some S is not P.

The letters S and P represent the subject and the predicate terms. Let us examine each standard form categorical proposition.

5.6.1 Universal Affirmative Proposition

A universal affirmative proposition asserts that every member of the first class is also a member of the second class. We should note that the opposite is not true. For example, 'All scientists are philosophers.' This proposition is about two classes scientists and philosophers and says that the subject term; class of scientists is included in the predicate term i.e. class of philosophers entirely. The name "Universal Affirmative" signifies that the whole subject class is included in the predicate class. The relationship of class inclusion holds between these two classes and class inclusion is complete or universal. Hence, all members of S are members of P.

5.6.2 Universal Negative Proposition

A universal negative proposition asserts that the first class is wholly excluded from the second class. For example, 'No scientists are philosophers.' The proposition claims that there is no member of class of scientists who is also a member of the class of philosophers. It denies universally that scientists are philosophers. The name "Universal Negative" signifies that the proposition denies that the relation of class inclusion holds between the two classes and denies it universally. Hence, no members of S are members of P.

5.6.3 Particular Affirmative Proposition

A particular affirmative proposition asserts that at least one member of the class designated by the subject term S is also a member of the class designated by the predicate term P. For example, 'Some scientists are philosophers.' Some members of the class of all scientists are also members of the class of all philosophers. But they do not affirm this class inclusion of all scientists as philosophers universally. Not all scientists universally but some particular scientists are said to be philosophers. However, it is important to note here that the word 'some' is indefinite in meaning. There is an ambiguity in defining the meaning of the word as it can be taken to indicate a whole range of meanings like, at least one, at least two, at least a hundred and many more. In our day-to-day usage the meaning of the term is determined by context of usage. In logic, it is customary to regard the word 'some' as meaning 'at least one.' The name "particular affirmative" signifies that the proposition affirms that the relationship of class inclusion holds; does not affirm it of the subject class universally but only partially, of some particular member or members of the subject class. Hence, some members of S are members of P.

5.6.4 Particular Negative Proposition

A particular negative proposition affirms that at least one member of the class designated by the subject term S is excluded from the whole of the class designated by the predicate term P. For example, 'Some scientists are not philosophers.' Like the Particular Affirmative Proposition this proposition is particular in as much as one does not refer to scientists universally being philosophers but at least one member or some members of that class. The name "particular negative" signifies that the proposition denies that the relationship of class inclusion does not hold for the subject class universally but only partially, of some particular member or members of subject class. Unlike the particular affirmative propositions, which affirm that the particular member or members of the subject class referred to are included in the predicate class, the particular negative propositions deny it. Hence, some members of S are not members of P.

Patrick J. Hurley and Lori Watson in their book *A Concise Introduction to Logic* argue that since the early middle ages the four kinds of categorical propositions have commonly been designated by letter names corresponding to the first four vowels of the Roman alphabet: A E I O.

Universal affirmative propositions	Called A propositions
Universal negative propositions	Called E propositions
Particular affirmative propositions	Called I propositions
Particular negative propositions	Called O propositions

Traditionally, it is believed that these letters were derived from the first two vowels in the Latin words; Affirm and Nego.

- Affirm ("I affirm")
- Nego ("I deny")

		n
UNIVERSAL	**A**	**E**
	f	
	f	g
PARTICULAR	**I**	**O**
	r	
	m	
	o	

Table 1: source: (Hurley and Watson, 2019, p. 211)

Check your Progress II

Note: a) Use the space provided for your answer.

b) Check your answers with those provided at the end of the unit.

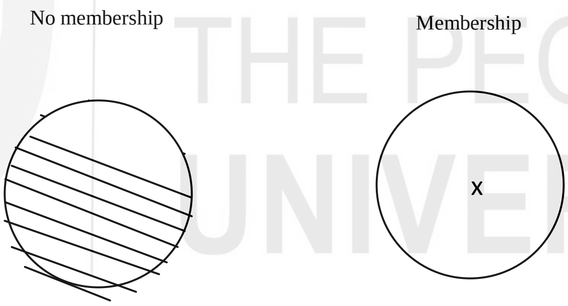
1. Write a note on the following:

   a) Categorical Proposition

5.7 VENN DIAGRAMMATICAL REPRESENTATION

English logician and mathematician John Venn (1834-1923) invented Venn Diagrams. These diagrams are used to graphically exhibit each and every categorical proposition. The categorical propositions can be diagrammatical represented with the usage of two interlocking circles, which stand for two classes involved. The visual representation of the class relationships within a categorical proposition is shown with the technique of shading in case of no member to show the class empty. The figure below shows the shaded portion stands for no membership in a class and the presence of members in a class is designated by 'x'. Moreover, we shall discover in the upcoming units that Venn Diagrams are extremely useful in appraising the validity of categorical arguments.

Figure 3



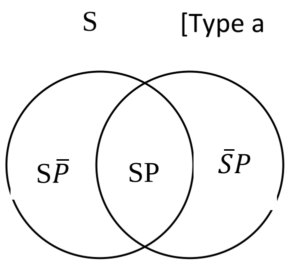
We label circle S, for "subject class", and the other circle P, for "predicate class."

Symbols $\bar{S}$ and $\bar{P}$ and used to indicate the regions which are "not S" and "not A". They are called S-bar and A-bar indicating the overbar on top of the letter symbols. These symbols refer to complementary classes. We shall understand the concept of a complementary class in the upcoming unit. In this unit, we shall use the two symbols to understand the regions as illustrated in the figure:

Symbol $\bar{S}$ designates the region which is 'not S.'

Symbol $\bar{P}$ designates the region which is 'not P.'

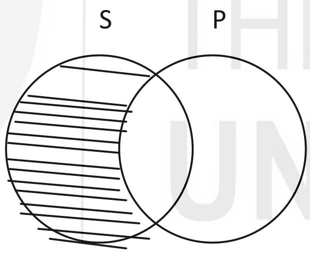
Figure 4



5.7.1 Universal Affirmative Propositions

The A proposition asserts, “All students are hard working people”. Our diagrammatical representation shows that there is a portion of S which is included in P. The figure designates that all members of class S are members of class P. Also, the diagram shows $S\bar{P}$ (that portion of S that stands outside of P) is shaded out, indicating that there are no members of S that are not members of P. The A proposition is diagrammatically represented in the following manner:

Figure 5: All S is P

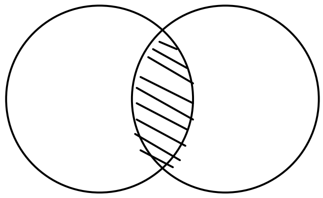


5.7.2 Universal Negative Propositions

An E Proposition “No students are hardworking people” universally denies that any member of class of students is a member of the class of hardworking people. The diagram exhibits this mutual exclusion by shading out SP (overlapping portion of the two circles representing S and P classes) indicating that there are no members in the common area between S and P. The E proposition is diagrammatically represented in the following manner:

S P

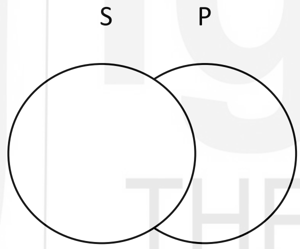
Figure 6: No S is P



5.7.3 Particular Affirmative Propositions

An I Proposition "Some students are hardworking people" asserts that there is at least one member of the class of students who is also a member of the class of hardworking people. Membership is shown by placing an x in SP (the overlapping region between the two circles) indicating that there is at least one member in the common area between the two classes. I proposition is diagrammatically represented in the following manner:

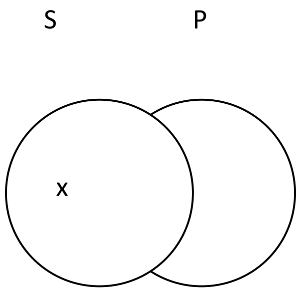
Figure 7: Some S is P



5.7.4 Particular Negative Propositions

An O proposition "Some students are not hard working" states that there is at least one member in the class of students who is not a member of class of hardworking people. The diagram indicates that there is at least one member of S that is not a member of P. This is shown by placing an x in $S\bar{P}$ (the region of S that is outside of P) indicating that there is at least one member in the region of S which is not a region of P. O proposition is diagrammatically represented in the following manner:

Figure 8: Some S is not P



Moreover, we should note few important points about the Categorical Propositions:

- Many times we find categorical propositions are not in standard form. Not all standard form categorical propositions are as simple and clear as the four examples discussed above. Many times they do not straight away begin with the words "all", "no", or "some". For example, 'Dogs are mammals', 'Few horses are white' etc. In Unit 3 we shall discuss the translation of such categorical propositions to standard form. Also, at times the subject and predicate terms of categorical propositions are expressed in a complicated manner. For example, "All S are not P" is not even a standard form categorical proposition.
- Words "all", "no" and "some" are referred to as quantifiers as they tell us how much of the subject class is included in and excluded from the predicate class. "All" as a quantifier tell us that the whole subject class is included in the predicate class. "No" as a quantifier tells us that the whole subject class is excluded from the predicate class. In affirmative categorical propositions "Some" as a quantifier tells us that at least one member of the subject class is included in the predicate class. In negative categorical propositions "some" as a quantifier tells us that at least one member of the subject class is excluded from the predicate class. There are exactly three forms of quantifiers ("All", "No" and "Some"). The next unit will discuss issues of Quality, Quantity and Distribution in details.
- There is a difference between "subject" and "subject term" as well as "predicate" and "predicate term." What we mean by "subject" and "predicate" in grammar is not the same with what we mean by "predicate term" and "subject term" in Logic. Let us take an example to understand this distinction; "All graduates of Indian Military academy are commissioned officers in Indian Army." For grammatical purposes the "subject" of the above proposition would be "All graduates of Indian Military academy" which would include the quantifier. Also, for grammatical purpose the "predicate" of the above proposition would be "are commissioned officers in Indian Army" which would include the copula. (Hurley and Watson, 2016, p.207-208)

5.8 GENERAL SCHEMA OF STANDARD FORM CATEGORICAL PROPOSITION

Standard form categorical propositions have four separate components which do not overlap. The letters S and P stand for the subject and predicate terms respectively. Between the subject and the predicate of every standard form categorical propositions stands form of the verb “to be.” Words “are” and “are not” are called copula because they connect the subject term with the predicate term. In a standard form categorical proposition forms of copula can be various forms of verbs “to be” such as “is”, “is not”, “will”, “will not”, “are”, “are not”.

For example;

- All whales are mammals.
- Some freedom fighters were teachers in primary schools.
- Some refugees will not get jobs.

In the propositions mentioned above “are, “were” “will” serve as copulas. However, to maintain the unity of form in categorical propositions all units in this block only use two varieties of copula “are” and “are not.” The general schema of a standard form categorical proposition is composed of four parts. In a proposition: first comes the quantifier, secondly the subject term, thirdly the copula, and finally the predicate term.

The schema is represented as:

Quantifier (subject term) copula (predicate term)

*****In case of a particular negative proposition there is also a negation (mostly ‘not’) after copula and before predicate term.

Analysis of Standard form categorical proposition is done in the following manner:

All graduates of Indian Military Academy are commissioned officers in Indian Army.

Quantifier: all

Subject term: graduates of Indian Military Academy

Copula: are

Predicate term: commissioned officers in Indian Army

Check your progress III

Note: a) Use the space provided for your answer.

b) Check your answers with those provided at the end of the unit.

1. Identify the subject term, predicate term, quantifier and copula in the following categorical propositions:

1. All animal rights activists are people who are motivated by empathy.
2. Some mangoes are not sweet fruits.
3. Some knives are sharp objects.
4. No bachelors are married men.
5. All trucks are vehicles.
6. No roses are marigolds.
7. Some dogs are pets.
8. Some grapes are sour fruits.
9. All buses are vehicles.
10. All reality TV stars are rich people.

5.9 LET US SUM UP

Our discussion on categorical propositions is summed up with the help of the table below:

Proposition form	**Name and Type**	**Example**
All S is P	Universal Affirmative A	All dogs are mammals
No S is P	Universal Negative E	No cats are dogs
Some S is P	Particular Affirmative I	Some dogs are pets
Some S is not P	Particular Negative O	Some dogs are not pets

5.10 KEY WORDS

Class: Class is a collection of all objects that have some specific characteristic in common. Eg. ‘dogs’, ‘tables’, ‘animals’, ‘fishes’ and others.

Categorical Proposition: A proposition that is about classes or categories, which affirm or deny that either in whole or in part one class S is included in some other class P.

Venn diagram: Diagrammatical representation of a categorical proposition which is used to display their logical forms by means of overlapping circles.

5.11 FURTHER READINGS AND REFERENCES

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5.12 ANSWERS TO CHECK YOUR PROGRESS

Check your Progress I

1. Compound Propositions

A compound proposition is constructed by two or more categorical propositions (singular or general). They are of three kinds:

A. Conjunctive

B. Disjunctive

C. Hypothetical

A. Conjunctive Propositions: Two Categorical propositions joined by ‘and’ make conjunctive compound propositions. For example, “Tiger roars and is carnivorous.”

B. Disjunctive Propositions: When two categorical propositions are joined by the relation of ‘either or’, then it is called disjunctive proposition. For example, “Either Sheila is in the gym or she is in the library.”

C. Hypothetical Propositions: When two Categorical propositions are joined by ‘if then’ relation then it produces a hypothetical proposition. For example, “If I get admission to Fashion Designing course then I can start my own Boutique.”

Check your Progress II

1.

Categorical propositions are building blocks of classical theory of deduction as they are fundamental units which form a categorical syllogism. A Categorical proposition is a proposition which relates two classes or categories. These classes are denoted by subject terms and predicate terms. Class is understood as a collection of all objects that have a specific characteristic in common. Categorical propositions either affirm or deny, that all or part of the class denoted by the subject term S is included in or excluded from the class denoted by the predicate term P. Let us take example of an argument:

All rabbits are fast runners.
Some horses are fast runners.
Therefore, some horses are rabbits.

All three propositions used in this argument, both premises and conclusion are categorical propositions. All three categorical propositions are about classes; class of all rabbits, class of some horses and class of some fast runners. The first proposition asserts that the entire class of rabbits is included in the class of fast runners. The second proposition asserts that some members of the class of horses are also members of the class of fast runners. The third proposition asserts that some members of the class of horses are also members of the class of rabbits. Based on relation of exclusion or inclusion between classes as affirmed or denied by categorical propositions we have exactly four types of categorical propositions:

1. Universal Affirmative Propositions
2. Universal Negative Propositions
3. Particular Affirmative Propositions
4. Particular Negative Propositions

Check your Progress III

1.

1. All animal rights activists are people who are motivated by empathy.

Subject Term: Animal rights activists

Predicate Term: people who are motivated by empathy

Quantifier: All

Copula: are

2. Some mangoes are not sweet fruits.

Subject Term: Mangoes

Predicate Term: sweet fruits

Quantifier: some

Copula: are

3. Some knives are sharp objects.

Subject Term: knives

Predicate Term: sharp objects

Quantifier: some

Copula: are

4. No bachelors are married men.

Subject Term: bachelors

Predicate Term: married men

Quantifier: No

Copula: are

5. All trucks are vehicles.

Subject Term: Trucks

Predicate Term: vehicles

Quantifier: All

Copula: are

6. No roses are marigolds.

Subject Term: Roses

Predicate Term: Marigolds

Quantifier: No

Copula: are

7. Some dogs are pets.

Subject Term: dogs

Predicate Term: pets

Quantifier: Some

Copula: are

8. Some grapes are sour fruits.

Subject Term: grapes

Predicate Term: sour fruits

Quantifier: Some

Copula: are

9. All buses are vehicles.

Subject Term: buses

Predicate Term: vehicles

Quantifier: all

Copula: are

10. All reality TV stars are rich people.

Subject Term: reality TV stars

Predicate Term: rich people

Quantifier: All

Copula: are

UNIT 2 QUALITY, QUANTITY, AND DISTRIBUTION*

Structure

6.0 OBJECTIVES

In the present unit our objective is to develop a clear understanding of the structure of a standard form categorical proposition.

In this unit we shall,

- methodically enumerate two essential attributes of a categorical proposition:

    1. Quality

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2. Quantity

- understand the meaning of 'term' and its various kinds.
- acquire an in-depth understanding of 'distribution of terms' depending on the quality and quantity in a standard form categorical proposition.

6.1 INTRODUCTION

Categorical Propositions are of four kinds depending on Quality, Quantity and Distribution of terms in them. We observe that the nomenclature used to refer to standard form categorical propositions describes every one of the four standard forms by first mentioning its quantity and second its quality namely; "Universal Affirmative", "Universal Negative" "Particular Affirmative" and "Particular Negative." In order to illustrate how quality and quantity are attributes pertaining to categorical propositions let us begin the unit with the help of illustrating a table.

Nomenclature	**Proposition**
Universal Affirmative	All S are P
Universal Negative	No S are P
Particular Affirmative	Some S are P
Particular Negative	Some S are not P

Table 1

6.2 QUALITY

Quality is an attribute of a categorical proposition. Every standard form Categorical Proposition has a quality, which is either *affirmative* or *negative*. If the proposition affirms some class membership, whether complete or partial, it possesses affirmative quality. However, if the proposition denies class membership, whether complete or partial, it possesses negative quality. Both universal affirmative propositions "All S are P" and particular affirmative propositions "Some S are P" are affirmative in quality. They are called *Affirmative Propositions.* Both universal negative propositions "No S are P" and particular negative propositions "Some S are not P" are negative in quality. They are called *Negative Propositions*.

Let us illustrate characterization of quality with the help of a table:

Proposition Type	**Proposition form**	**Example**	**Quality**
A	All S is P	All dogs are mammals.	Affirmative
E	No S is P	No dogs are cats.	Negative
I	Some S is P	Some cats are pets.	Affirmative
O	Some S is not P	Some dogs are not pets.	Negative

Table 2

6.3 QUANTITY

Like Quality Quantity is also an attribute of a categorical proposition. Every categorical proposition has a quantity either *universal* or *particular*. Quantity depends on whether the statement makes a claim about every member of the class denoted by the subject term or only some members of the class denoted by the subject term. If the proposition refers to all members of the class designated by its subject term, it possesses 'universal' quantity. However, if the proposition refers only to some members of the class designated by its subject term, it possesses 'particular' quality.

Both universal affirmative proposition "All S are P" and universal negative proposition "No S are P" are universal in quantity. They assert something about every member of the S class and therefore are *universal propositions.* These propositions assert that every member of the subject class is either universally included in or is universally excluded from members of the predicate class.

Both particular affirmative proposition "Some S are P" and particular negative proposition "Some S are not P" are particular in quantity. They assert something about some members (one or more members) of the S class and therefore they are *particular propositions.* These propositions make a limited claim that some members of their subject class are either included in or excluded from members of predicate class.

Let us illustrate characterization of quantity with the help of a table:

Proposition Type	**Proposition form**	**Example**	**Quantity**
A	All S is P	All spiders are eight legged creatures.	Universal
E	No S is P	No dogs are eight legged creatures.	Universal
I	Some S is P	Some Indians are conservatives.	Particular
O	Some S is not P	Some Indians are not Conservatives.	Particular

Table 3

It is worthy to note that all categorical propositions begin with the words, which show there quantity; "All", "No", "Some." "All" and "No" indicate that the quantity is universal, "Some" indicates that the quantity is particular. Quantity of a categorical proposition can be determined by merely seeing the quantifier. For example; by seeing "All" and "No" we understand that the proposition is universal and by looking at "some" we realize that the proposition is particular. Also, the quantifier "no" adds the indication of negative quality of E proposition.

However, Categorical Propositions have no "qualifier." In the case of Universal Propositions we can determine the quality by looking at the quantifier. For e.g. we identify that the quality of E proposition is negative by looking at "no", which is also a quantifier. However, in case of particular propositions the quality can be known by looking at the copula. For e.g. in particular proposition "Some S is P" copula is "is", which showcases that the quality is affirmative and in particular proposition "Some S is not P" copula is "is not", which showcases that the quality is negative (Copi et al., 2016, p. 107). We can summarise the above section with the help of a table:

Categorical Proposition	**Letter Indication**	**Quantity Quantity**

All S are P	A	Universal Affirmative
No S are P	E	Universal Negative
Some S are P	I	Particular Affirmative
Some S are not P	O	Particular Negative

Table 4

The meaning of the notations of quality and quantity can be understood in class terminology through the following table:

	Proposition	Meaning in Class Notation
A	All S are P	Every Member of the S class is a member of the P class; that is, the S class is included in the P class.
E	No S are P	No member of the S class is a member of the P class; that is S class is excluded from the P class.
I	Some S are P	At least one member of the S class is a member of the P class.
O	Some S are not P	At least one member of the S class is not a member of the P class.

Table 5 Source: (Hurley and Watson, 2016, p.211)

Check your Progress I

Note: a) Use the space provided for your answer.

b) Check your answers with those provided at the end of the unit.

1. Write a note on,

Quality of a standard form categorical proposition

----

2. State the Quality and Quantity of the following categorical propositions.

1. Some students are hardworking people.
2. All teachers are government servants.
3. No birds are reptiles.
4. All lizards are reptiles.
5. Some engineers are not talented.
6. All fast foods items are unhealthy.
7. No restaurants are safe places.
8. Some laptop screens are flexible.
9. Some movies are not based on true stories.
10. All festivals are joyous occasions.

6.4 THE CONCEPT OF TERM

We have already discussed the distinction between 'subject' and 'subject term' as well as 'predicate' and 'predicate term' in the previous unit. Before developing an understanding of distribution of terms we first begin by understanding the meaning of term. A word or a group of words which are 'subject' or 'predicate' of a proposition are called terms. A 'term' must have both a definite meaning and it should be either a subject or a predicate of a proposition. There are two terms in each standard form categorical proposition. Historically, the word ‘term’ has its origins in the latin word *terminus* i.e. a limit or a boundary. In a way a ‘term’ limits our thought as it clearly defines the meaning of a word. Let us analyze the example of following categorical proposition:

All dogs are mammals.

This proposition comprises of four words, namely; ‘all’, ‘dogs’, ‘are’, and ‘mammals.’ ‘Dogs’ and ‘mammals’ are words, which qualify as terms. While all terms are words but all words are not terms.

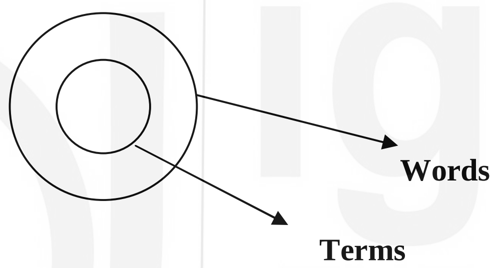

Figure: 1

Moreover, there are three significant concepts to understand in order to explain the functioning of a term:

1. Types of terms
2. Distribution of Terms
3. Denotation and Connotation of terms

6.5 TYPES OF TERMS

Logician Dr. Krishna Jain in her book, *A Textbook of Logic* argues that logicians have classified terms into four broader groups. However, it should be noted that one term can belong to two or more categories. These categories are:

A. Singular and General Terms
B. Concrete and Abstract Terms

C. Positive and Negative Terms
D. Collective and Distributive Terms

6.5.1 Singular and General Terms

With a singular term we refer to one single or specific person, object or thing. Examples of singular terms are Mohan, Geeta, Bangalore, this table, that cycle, I etc. Singular terms are of two types:

1. Proper names or nouns: All proper nouns used in propositions either as a subject or as a predicate are called singular terms. For instance school, college, nursery, mouse etc.
2. Specifically or uniquely described term: Specifically described terms refer to single person or object. Although they are not proper names nonetheless they refer to a unique reference. “The Prime Minister of India in 1962 Indo-China War” has a unique reference because it refers to a unique person ‘Mr. Jawaharlal Nehru’.

On the other hand when a common noun is used as a ‘term’ in a proposition it is called a general term. In the proposition ‘Hospital is a public institution’, the term ‘hospital’ is used as a common or general term.

6.5.2 Concrete and Abstract Terms

Concrete terms refer to objects, things, persons and articles like, rat, table, copy, box, tree, man and others. On the other hand, abstract terms refer to abstract entities i.e. numbers, classes, attributes or characteristics in themselves. Examples of abstract terms are Happiness, Sadness, Cowness, Oneness, Blueness etc. However, we should clarify at this stage that although ‘sadness’ is an abstract term but ‘sad’ is not (it is an adjective). However, depending on the context the same term can be used as a concrete or abstract term. Let us consider two uses of the term “Basketball team”:

- Basketball team got aggressive.
- Basketball team teaches discipline.

In the first proposition the term “basketball team” is used as a concrete term because we are referring to a particular team whereas in the second proposition it is used as an abstract term because we are referring to the term conceptually.

At this juncture it is important to note that in a categorical proposition both subject and predicate terms are nouns. If either of the terms is not noun then it should be changed in appropriate noun so that it becomes a concrete term. Let us take an example: “Mangoes are yellow” is reduced to “Mangoes are yellow objects”. Both subject term “mangoes” and predicate term “yellow objects” are concrete terms. We shall discuss more on converting a proposition into standard form categorical proposition in Unit 3; “Translating Categorical Propositions into Standard Form.”

6.5.3 Positive and Negative Terms

Positive terms affirm presence of an attribute but negative terms deny the presence of an attribute. Examples of positive terms are happy, moral, true, citizen etc. However, negative terms are shown by examples like unhappy, immoral, false etc. We shall qualify that although there are negative propositions, like, “Some men are not moral” but there can also be an affirmative proposition with a negative predicate, like, “Some men are immoral.” We shall explore more about this distinction in Unit 4 on Immediate Inferences.

6.5.4 Collective and Distributive Terms

Collective terms are applicable on group of persons, objects or things where the entire class is taken into consideration. For example terms like, university, country, laboratory etc are collective terms. However, distributive terms refer to all the members of the class separately i.e. individuals who compose the group. No term is collective or distributive in itself. Instead it is the use of the term in the proposition, which decides whether the term is used in a collective or distributive manner (Jain, 2014, p. 74-77)

6.6 CONNOTATION AND DENOTATION OF TERMS

In formal logic in order to make our reasoning valid we need to make sure that the meaning of terms used in our reasoning should be absolutely clear. There are two different techniques for the same namely; denotative and connotative techniques. It would be apt to say that “denotation denotes the objects, connotation connotes the characteristics.” (Jain, 2014, p.69)

Denotation of a term indicates all objects or persons referred by the term. For example; the denotation of the term ‘singer’ is Lata Mangeshkar, Asha Bhosle, Sonu Nigam, Anuradha Porwal etc.

Connotation of a term is the set of qualities and characteristics possessed by all objects or persons referred by the term. Connotation refers to those qualities, which are possessed by all the members who are denoted by the term. Let us consider example of connotation of the term ‘animal’. Although there might be a range of qualities or characteristics possessed by all animals but ‘mortality’ is an essential quality possessed by all. However, there are many other characteristics, which are inessential because they are not possessed by every animal. Animals can be broadly divided on the basis of their biological features into mammals, birds, reptiles, fish and amphibians. Each group possesses different characteristics, like, laying eggs, breathing through fins, breathing through lungs, scales on body, fur or hair on body, two legs, four legs, etc. Therefore, the connotation of a term refers to only those qualities, which are indispensible in providing meaningfulness to the term.

In the previous unit we were acclimatized with the concept of class. Let us reframe the concept of connotation and denotation in the context of class. A class consists of dual meaning; denotative and connotative. Let us take example of the class of men. The members belonging to the class of men, like, Rohan, Ojas, Mohan etc refer to denotation of the term ‘man.’ However, the class characteristics, like, rationality, mortality and others, which are possessed by every member of the class refer to the connotation of the term.

Moreover, it is significant to understand the relation between Denotation and Connotation of a term in terms of extension and intention. Denotative meaning of a term is referential or extensional because it refers to membership in a class and indicates the extent to which the term is applicable. On the other hand Connotative meaning of a term is intentional which means the intended characteristics of a term. Moreover, they are inseparably related. We gather that with increase in qualities (intension or connotation) the members (denotation or extension) decrease and with the decrease in the qualities (intension or connotation) the members (denotation or extension) increase. Also, we should note that it is the connotation, which determines denotation and not the other way round. The reason is that connotation is the set of characteristics, which fix members in a class. We can understand this relation with the help of an example. Despite of constant increase in the Denotation (the members) in animal population the connotation of the term ‘animal’ (the essential characteristic of ‘mortality’) has remained the same. Hence a term’s intention determines its extension and not vice-versa.

6.7 DISTRIBUTION OF TERMS

Distribution is an attribute of the subject and predicate terms of propositions. Distribution characterizes the manner in which subject and predicate terms occur in categorical propositions. As we move to Categorical Syllogism in the upcoming chapters, developing an understanding of distribution of terms becomes very important. The determination of distribution of terms in standard form categorical propositions helps in evaluating validity/ invalidity of Categorical Syllogisms. In the preceding sections we have discussed that the subject and the predicate terms of a standard form categorical proposition represent classes of objects. Every proposition is about these classes; a proposition may refer to either all members of a class or to some members of that class. A proposition distributes a subject or predicate term if it refers to all members of the class, which are designated by the term. Let us elucidate the distribution of subject and predicate terms in all the four standard-form categorical propositions.

6.7.1 Distribution of terms in Universal Affirmative Propositions

All soldiers are citizens.

The proposition asserts that each and every member of the class of soldiers is a citizen but does not state the reverse i.e. makes no such assertion about the class of citizens. It neither affirms nor denies anything about the class of citizens. The subject term of the A proposition is distributed by that proposition but the predicate term of A proposition is undistributed by it. This proposition refers to all members of the class designated by its subject term S. Therefore it distributes its subject term. However, it does not refer to all members of the class designated by its predicate term. And hence, the predicate term is undistributed in A proposition.

6.7.2 Distribution of terms in Universal Negative Propositions

No soldiers are cowards.

An E proposition asserts about each and every member; that if he is a soldier then he is not a coward. It says that the whole class of soldiers is excluded from the class of cowards as well as the whole class of cowards is excluded from the class of soldiers. Like the A proposition, E proposition distributes each and every member of its subject class therefore it distributes its subject term. But, unlike the A proposition which does not distribute its predicate term, E proposition distributes its predicate term. The proposition clearly asserts of each and every coward that he or she is not a soldier. Therefore, E proposition distributes both the subject and the predicate terms.

6.7.3 Distribution of Terms in Particular Affirmative Propositions

Some dogs are pets.

An I proposition makes no assertion whatsoever about the class of dogs and makes no assertion about the class of pets. The proposition makes no claims to inclusion or exclusion of all members of the class of dogs into the members of the class of pets. It neither says anything about each and every member of class of dogs nor about each and every member of class of pets. The proposition only suggests that there are some dogs (at least one), which are taken as pets. Therefore neither of the classes is wholly included or excluded from the other. Hence, in a particular affirmative proposition both subject and predicate terms are undistributed.

6.7.4 Distribution of terms in Particular Negative Propositions

Some musicians are not pianists.

An O proposition is similar to I proposition in as far as it does not distribute its subject term. The particular negative proposition says nothing about *all* musicians but asserts that *some* members of the class of musicians do not belong to the class of pianists. Some part of class of musicians is partly excluded from the whole of class of pianists. However, O propositions say that given the reference to some members of the class of musicians each and every member of the class of pianists is not one of those musicians. So, particular negative proposition distributes its predicate term but not its subject term.

We observe that both universal propositions distribute their subject terms but both particular propositions do not distribute their subject term. However, both affirmative propositions do not distribute their predicate term but both negative propositions distribute their predicate terms. We can also make the same point in terms of quantity and quality of propositions, which play a role in understanding the distribution of respective terms. The quality of a standard form categorical proposition determines whether it distributes the predicate term. The quantity of a standard form categorical proposition determines whether it distributes the subject term. To conclude,

A Proposition distributes only its subject term.

E Proposition distributes both subject and predicate terms.

I proposition distributes neither subject nor predicate term.

O proposition distributes only its predicate term.

We illustrate diagrammatically the distribution of terms in standard form categorical propositions:

Distribution of terms	**Predicate term undistributed**	**Predicate term distributed**
Subject term distributed	A: All S is P	E: No S is P
Subject term undistributed	I: Some S is P	O: Some S is not P

Table 6 Source: (Copi et al., 2016, p. 109)

Check your Progress II

Note: a) Use the space provided for your answer.

b) Check your answers with those provided at the end of the unit.

Write a note on the following,

1. Connotation and Denotation of a term.

----

2. State whether the subject and predicate terms in the following propositions are distributed or undistributed.

1. All goats are mammals.

2. Some buildings are tall.

3. Some fruits are not sweet.

4. All officers in the Indian navy are trained in swimming.

5. No government employee is illiterate.

6. All good services are expensive.

7. All tomatoes are sour.

8. Some fiction books are inspired by true-life events.

9. No hill stations are hot places.

10. Some curtains are not thick.

6.8 LET US SUM UP

We can summarise the above discussion with the help of a table:

Proposition	**Letter**	**Quantity**	**Quality**	**Distribution**	**Distribution**

	Name			of Subject term	of Predicate term
All S are P	A	Universal	Affirmative	Yes	No
No S are P	E	Universal	Negative	Yes	Yes
Some S are P	I	Particular	Affirmative	No	No
Some S are not P	O	Particular	Negative	No	Yes

6.9 KEY WORDS

Distribution of terms: An attribute which describes the relationship between a categorical proposition and its subject and predicate terms. Distribution determines whether or not the proposition refers to every member of the class represented by a given term.

Quality: An attribute of every categorical proposition, determined depending on whether the proposition affirms or denies the class inclusion. Every categorical proposition has quality, which is either universal or particular.

Quantity: An attribute of every categorical proposition, determined depending on whether the proposition refers to all members or some members of the class designated by its subject term. Every categorical proposition has quantity which is either universal or particular.

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6.11 ANSWERS TO CHECK YOUR PROGRESS

Check your Progress I

1.

Quality is an attribute of a categorical proposition. Every standard form Categorical Proposition has a quality, which is either affirmative or negative. Eminent professors of Logic Irving M. Copi, Carl Cohen and Kenneth McMahon assert that if the proposition affirms some class membership, whether complete or partial, it possesses affirmative quality. However, if the proposition denies class membership, whether complete or partial, it possesses negative quality. Both universal affirmative propositions "All S are P" and particular affirmative propositions "Some S are P" are affirmative in quality. Both universal negative propositions "No S are P" and particular negative propositions "Some S are not P" are negative in quality. Following table can be drawn to show the quality of four standard-form categorical propositions.

Proposition Type	**Proposition form**	**Example**	**Quality**
A	All S is P	All cats are mammals.	Affirmative
E	No S is P	No shirts are skirts.	Negative
I	Some S is P	Some knives are sharp objects.	Affirmative
O	Some S is not P	Some books are not educational.	Negative

2.

1. Quality: Affirmative Quantity: Particular

2. Quality: Affirmative Quantity: Universal

3. Quality: Negative Quantity: Universal

4. Quality: Affirmative Quantity: Universal

5. Quality: Negative Quantity: Particular

6. Quality: Affirmative Quantity: Universal

7. Quality: Negative Quantity: Universal

8. Quality: Affirmative Quantity: Particular

9. Quality: Negative Quantity: Particular

10. Quality: Affirmative Quantity: Universal

Check your Progress II

1.

There are two different techniques to clarify the meaning of terms namely; denotative and connotative techniques. Denotation of a term is the object or person referred by the term. For example; the denotation of the term animal is cats, dogs, cows, tigers etc, the denotation of the term musician is, A. R. Rahman and others. Connotation of a term is the set of qualities and characteristics possessed by all objects or persons referred by the term. Connotation refers to those qualities, which are possessed by all the members denoted by the term. While Denotation denotes the objects and connotation connotes the characteristics possessed by the objects. The class of men has two fold aspects. The members belonging to the class of men say Rohit, Shyam, Gautam etc are denotation of the term man. However, the class characteristics like rationality, mortality and others, which are possessed by every member of the class are the connotation of the term.

The relation between Denotation and Connotation of a term can be understood in terms of its extension and intention. Denotative meaning of a term is referential or extentional as it refers to members of the class. In this sense Denotation indicates the extent to which the term is applicable. On the other hand Connotative meaning of a term is intentional which means the intended and indicated characteristics of a term. We can discuss them separately but they are inseperably related. We gather that with increase in qualities (connotation) the members (denotation) decrease. Similarly, with the decrease in the qualities (connotation) the members (denotation) increase.

2.

1. Subject: Distributed Predicate: Undistributed

2. Subject: Undistributed Predicate: Undistributed

3. Subject: Undistributed Predicate: Distributed

4. Subject: Undistributed Predicate: Undistributed

5. Subject: Distributed Predicate: Distributed

6. Subject: Distributed Predicate: Undistributed

7. Subject: Distributed Predicate: Undistributed

8. Subject: Undistributed Predicate: Undistributed

9. Subject: Distributed Predicate: Distributed

10. Subject: Undistributed Predicate: Distributed

UNIT 7 TRANSLATION OF CATEGORICAL PROPOSITIONS INTO STANDARD FORM*

Structure

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7.0 OBJECTIVES

Language is a dynamic and ever evolving phenomenon. Many arguments in our day to day life contain non standard form propositions. A standard form categorical syllogism is constituted of standard form propositions. In everyday interactions many syllogistic arguments contain nonstandard form propositions. In order to reduce an argument to standard form categorical syllogism it is required that their constituent propositions should be translated to standard form propositions. It is important to understand the meaning designated by a proposition to determine which of the categorical proposition is asserted or denied by it. To this end the list of methods enumerated to translate a proposition into standard form categorical proposition can never be exhaustive.

The objective of the present unit is,

- to explain comprehensive understanding of some methods used to translate a proposition into standard form categorical proposition.

7.1 INTRODUCTION: TRANSLATING ORDINARY LANGUAGE STATEMENTS INTO STANDARD FORM

In our everyday life we use language to communicate our thoughts and convey our emotions. In unit 1 we have discussed that this communication is possible through grammatical unit called 'sentence.' Moreover, in natural and social sciences we present our analysis through hypothetical, conjectural, speculative, perspectival opinions and beliefs. Broadly, sentences can be declarative, imperative, exclamatory, interrogative and of several other variety. However, in formal logic we are concerned with declarative statements i.e. propositions, since only they assert or deny a state of affairs. To begin with let us consider few examples of propositions, which are not in standard form:

"All students are not hard working"

"A cow is a vegetarian animal"

"Many dogs are pets"

"Roses are red"

"Lilies are fragrant"

The above mentioned propositions can be translated in standard form categorical propositions:

"Some students are not hard working people"

"All cows are vegetarian animals"

"Some dogs are pets"

"Some roses are red flowers"

"All lilies are fragrant flowers"

Many syllogisms, used for argumentations in our day to day life, are composed of nonstandard form propositions. In order to get standard form categorical syllogism we are required to translate the constituent propositions into standard form. We can form a categorical syllogism only with the help of standard form categorical propositions. There are various methods to reduce a non standard form sentence into standard form proposition. However, it is impossible to form an exhaustive list of set of rules for such translation as ordinary language is multifaceted and full of diversity. Although we can never develop a complete set of rules but we can describe a number of techniques that prove useful in dealing with certain kinds of non standard form of propositions. It is very significant that we have the capability to understand the given non standard form proposition so that the meaning of the given proposition should not be lost in this process. The present unit has primarily followed the methods for standard-translations suggested by Copi, Cohen and McMahon (2016) and Hurley and Watson (2019).

7.1 ARRANGING STANDARD FROM INGREDIENTS IN ORDER

In many propositions, although all the four components of standard form categorical proposition are present but it is observed that they are not arranged in the proper order. First, subject and predicate terms have to be identified and second all the constituents of a proposition have to be arranged in the standard schema:

Quantifier (subject term) copula (predicate term)

Bats are all blind.

Standard form translation: All bats are blind.

All is well that ends well.

Standard form translation: All things that end well are things that are well.

Gone are days of fun.

Standard form translation: All days of fun are days that are gone.

7.2 TRANSLATING TERMS WITHOUT NOUNS BY REPLACING THEM WITH PLURAL NOUN OR PRONOUN

In a categorical proposition, nouns or pronouns denote classes. For e.g. in the categorical proposition, 'Some Dogs are pets', 'dogs' being a common noun stands for class of dogs and 'pets' being a common noun stands for class of pets. If either subject or predicate is not noun, then it has to be translated into appropriate noun. However, in categorical propositions adjectives (and participles) connote attributes. In case a proposition has any term (subject or predicate), which is adjective then we will have to use a plural noun or pronoun in its place as only they denote the class. We should ensure that in a standard form categorical proposition there is one subject term (noun) and one predicate term (noun) and a copula to join them. In the examples taken below ‘green’ and ‘vegetarian’ designate attributes rather than a class and therefore these propositions have to be translated into standard form.

All cacti are green.

Standard form translation: All cacti are green plants.

All elephants are vegetarian.

Standard form translation: All elephants are vegetarian animals.

7.3 NON STANDARD VERBS TO BE REPLACED WITH STANDARD COPULA

In our day to day communication we often use statements which either incorporate other forms of the verb ‘to be’ or do not have any form of the verb ‘to be.’ We have already qualified in the first unit on categorical propositions that schematic representation of standard form categorical propositions follows ‘are’ and ‘are not’ as copula. The first variety of statements which have other forms of verb “to be” can be translated as follows:

Some geography books will be delivered shortly.

Standard form translation: Some geography books are books that would be delivered shortly.

Some people drink coffee.

Standard-from translation: Some people are coffee drinkers.

The second variety of statements, wherein there is no occurrence of the verb “to be”, can be translated as follows:

All tigers roar.

Standard form translation: All tigers are animals that roar.

All pigeons fly.

Standard form translation: All pigeons are birds that fly.

Some monkeys climb the tree.

Standard form translation: Some monkeys are animals that climb the tree.

Ojas plays football.

Standard form translation: Ojas is a football player.

7.4 TRANSLATING SINGULAR PROPOSITIONS

A singular proposition either asserts or denies that a particular individual or object belongs to a given class. They make assertion or denial about a specific person, thing, time or place. These propositions are generally converted into Universal propositions (A or E). Examples:

Einstein is a physicist.

This table is not an antique.

Unlike categorical propositions they do not affirm or deny the inclusion of one class in another. However, we can interpret a singular proposition as a proposition which deals with classes by interpreting them in the following manner:

"To every individual object there corresponds a unique **unit class** (one-membered class) whose only member is that object itself. Then, to assert that an object s belongs to a class P is logically equivalent to asserting that the unit class S containing just that object s is wholly included in the class P. And to assert that an object s does *not* belong to a class P is logically equivalent to asserting that the unit class S containing just that object s is wholly excluded from the class P." (Copi et al., 2016, p.186)

Moreover, Singular propositions are translated into universal propositions by using a "parameter" which is a tool used in a statement to alter the form without causing any change in meaning. Some parameters suggested are:

places identical to

people identical to

things identical to

cases identical to

times identical to

Let us translate the following singular propositions with the help of parameters:

Einstein is a physicist.

Standard form translation: All people identical to Einstein are people who are physicists.

Explanation: Effectively what we are claiming here is that only one person can be identical to Einstein i.e. Einstein himself, the term "people identical to Einstein" denotes Einstein as this class has Einstein as its only member. (Hurley and Watson 2019, p.261)

This table is not an antique.

Standard form translation: No things identical to this table are things which are antique.

Geet went shopping.

Standard form translation: All people identical to Geet are people who went shopping.

Or

Geet is a person who went shopping.

However, at this juncture it is important to take note that there are some pertinent issues arising out of existential import of categorical propositions, namely, according to Boolean interpretation singular propositions have existential import but universal propositions do not have existential import, which we shall see in the upcoming units.

Check your Progress I

Note: a) Use the space provided for your answer.

b) Check your answers with those provided at the end of the unit.

1. Translate the following statements to standard form propositions.

1. All roses are fragrant.
2. Skyscrapers are all tall buildings.
3. All dogs bark.
4. Some pigeons flew.
5. Reet plays tennis.
6. No neem leafs are sweet.
7. Some cars are not spacious.
8. There are no insurance policies which give good return claims.
9. Rohan is sitting at home.
10. Some cats climb the trees.
11. Not everyone subscribes to educational journals.
12. The moon is full tonight.
13. I hate wine.
14. All ducks swim.
15. Some birds fly during the winter.

7.5 TRANSLATING CATEGORICAL PROPOSITIONS WHOSE QUANTITIES ARE INDICATED BY WORDS OTHER THAN THE STANDARD FORM QUANTIFIERS "ALL" "NO" AND "SOME"

Many times statements begin with quantity designators other than the quantifiers or the quantity designators are not specified at all. The former cases require us to examine the statement in proper context and then rephrase the quantity designator. However, in the latter case the quantity designator is missing and we ought to provide it in terms of standard form.

Case 1

Statements beginning with ‘every’ ‘any’ ‘everything’ ‘anything’ (without any negation) are translated as A propositions in the following manner:

Every person has his day.

Standard form translation: All persons are beings who have their days.

Any day of the week is convenient.

Standard form translation: All days of the week are convenient days.

Everything in this room is expensive.

Standard form translation: All things in this room are expensive things.

Anything comes at a cost.

Standard form translation: All things are entities that come at a cost.

In parallel to these there are other examples of designators belonging to class of persons, like, whoever, everyone, anyone, whosoever, who and others. They are also translated as A propositions. For example:

Whoever votes, is a good citizen.

Standard form translation: All who vote are good citizens.

Anyone who goes to the party would be implicated.

Standard form translation: All who go to the party are those who are implicated.

Everyone who votes is above 18 years of age.

Standard form translation: All who vote are above 18 years of age.

Case 2

Indefinite articles ‘a’ or ‘an’, ‘the’ are also used to designate quantity. Although they do not clearly state quantity represented by them but when we examine the statement in its context, depending on the meaning, it is either translated as A or I proposition. Let us first consider examples of propositions which can be reasonably interpreted as universal propositions:

A dog is a mammal.

Standard form translation: All dogs are mammals.

An elephant is vegetarian.

Standard form translation: All elephants are vegetarian animals.

The snake is a reptile.

Standard form translation: All snakes are reptiles.

Let us now discuss different examples of propositions carrying ‘a’, ‘an’ and ‘the’ where the standard form translation is done to particular propositions.

A pigeon flew over the bridge.

Standard form translation: Some pigeons are birds which flew over the bridge.

A cat is rescued from the sea.

Standard form translation: Some cats are creatures that are rescued from the sea.

The frog in the left corridor is green.

Standard form translation: Some frogs in the left corridor are creatures that are green.

Judging from the context we can make out that article ‘a’ in the above two cases refers to a member and do not refer to all members of the class of pigeons, who flew over the bridge; or cats which are rescued from the sea. Similarly, article ‘the’ in the last case does not refer to all members of the class of frogs. While judging these propositions we have to be sensitive to the context.

We have translated the propositions beginning with ‘every’ and ‘any’ as A propositions in Case 1. Now let us see the examples of propositions beginning with ‘not every’ and ‘not any.’ In case of ‘not every’ the proposition is translated as particular negative and ‘not any’ is translated as universal negative. Examples:

Not every rose is red.

Standard form translation: Some roses are not red.

Not any student is full-time employed.

Standard form translation: No students are people who are full-time employed.

Words like ‘hardly’, ‘rarely’, ‘seldom’, ‘scarcely’, ‘little’, ‘not always’, ‘not everywhere’, ‘sometimes not’ are indicators of particular negative propositions. But the words like ‘never’, ‘nowhere’, ‘under no circumstances’ indicate universal negative propositions. (Copi et al., 2016, p.188)

7.6 CATEGORICAL PROPOSITIONS WHICH CARRY WORDS WHICH DESIGNATE QUANTITY MORE SPECIFICALLY THAN STANDARD FROM PROPOSITIONS

Quantifiers such as, ‘one’, ‘two’, ‘three’, ‘many’, ‘few’, ‘a few’, ‘most’ or any other number mentioning quantity have to be translated to standard form. Proposition carrying ‘one’ should be translated same as a singular proposition**.** However, a proposition carrying all other numerical designators like, two, three, four, ten, fifty etc. to designate quantity should be translated as I propositions carrying ‘some’ as quantifier. ‘Many’, ‘several’, ‘sometimes, ‘usually’, ‘generally’ ‘occasionally’ ‘once’, ‘majority’, ‘most of them’, ‘once’ etc should also be translated as ‘some’.

However, special attention should be put to propositions using ‘a few’ and ‘few’ as designators. They cannot be translated into a single categorical proposition. Instead they are translated as a compound of I and O proposition. (Hurley and Watson, 2019, p. 264)

A few soldiers are heroes.

Standard form translation: Some soldiers are heroes and some soldiers are not heroes.

Few girls are passionate.

Standard form translation: Some girls are passionate and some girls are not passionate.

Most policemen are honest.

Standard form translation: Some policemen are honest.

7.7 CATEGORICAL PROPOSITIONS WHICH DO NOT CARRY ANY WORDS AT ALL TO INDICATE QUANTITY

At times there are propositions with no quantifier. In these cases what the sentence wants to express becomes quite ambiguous. In these cases the meaning of the sentences can be determined only by examining the context in which they occur. Let us take some examples:

Whales are mammals.

Students are absent.

Cars are parked in front of the house.

In the first example, "Whales are mammals", it is very probable that it refers to all whales and should be translated as "All whales are mammals". In the case of second statement, "Students are absent" it is clear that only some students are referred to and thus the standard form translation would be "Some students are beings who are absent". Similarly, on a careful analysis of the context the third statement would also be translated as "Some cars are vehicles that are parked in front of the house".

7.8 TRANSLATING PROPOSITIONS WHICH DO NOT RESEMBLE STANDARD FORM CATEGORICAL PROPOSITIONS AT ALL BUT THEY CAN BE TRANSLATED INTO THEM

In such cases, we begin by identifying the relevant context. Furthermore, we shall identify subject term and predicate term and then place the appropriate copula.

Not all citizens believe in God.

Standard form translation: Some citizens are not believers in God.

There are red roses.

Standard form translation: Some roses are red things.

Nothing is both hard and soft.

Standard form translation: No hard objects are soft objects.

There are good human beings.

Standard form translation: Some human beings are good human beings.

There are no red frogs.

Standard form translation: No frogs are red things.

Check your Progress II

Note: a) Use the space provided for your answer.

b) Check your answers with those provided at the end of the unit.

1. Translate the following statements to standard form propositions.

1. Textbooks are useful.

2. Logic problems are difficult.

3. A tiger is a mammal.

4. A fish is not a mammal.

5. Children are human beings.

6. Not every citizen votes.

7. Not a single dog is a cat.

8. Many entertainers are actors.

9. Few sailors are courageous.

10. Any student is eligible.

11. Every student is not resourceful.

12. Students are present.

13. There are honest politicians.

14. Flowers are beautiful.

15. Emeralds are green gems.

16. There are lions in the zoo.

17. A tiger is a mammal.

18. A fish is not a mammal.

19. A tiger roared.

20. Children are human beings.

21. Children live next door.

22. Children are naughty.

23. Not all players are physically fit.

24. Not every event is well organized.

25. There are no blue parrots.

7.9 TRANSLATING EXCEPTIVE PROPOSITIONS

There are quasi-numerical terms, which require our careful attention like 'almost all', 'all but', 'all except' and others. Statements which use these expressions are called exceptive statements because they make exceptions in a general class. For example:

All except children are allowed to enter the cinema hall.

All but children are allowed to enter the cinema hall.
Children alone are not allowed to enter the cinema hall.

Translating these propositions is difficult as these propositions make two assertions. They are compound propositions and therefore we cannot choose them to represent one single standard form categorical proposition. To make a fair representation of their meaning each of these propositions should be translated into a conjunction of two standard form categorical propositions. All three propositions mentioned above have the same meaning and would be translated as "All non children are allowed to enter the cinema hall, and no children are allowed to enter the cinema hall." Their logical form and standard translation can be represented as:

All except S is P

Standard form translation: All non S are P, and no S are P.

Another set of quasi numerical qualifiers include 'almost all', 'not quite all', 'all but a few' and 'almost everyone.' Propositions carrying these phrases would be treated in the similar manner as the set of exceptive propositions mentioned above. However, they will be written as conjunction of I and O proposition. Examples of these compound propositions:

Almost all employees were in the office.

Not quite all employees were at the office.

All but a few employees were at the office.

Almost everyone among employees were at the office.

Both propositions mentioned above have the same meaning. They assert that some employees were at the office and deny that all employees were at the office. Therefore they are translated as:

Some employees are persons who were at the office, and some employees are not persons who were at the office.

7.10 TRANSLATING EXCLUSIVE PROPOSITIONS

Categorical Propositions involving the words ‘only’, ‘none but’ ‘none except’ and ‘no…except’ are called exclusive propositions for the reason in these propositions the predicate term is exclusively applied to the subject named. Usually we confuse the positioning of subject and predicate terms in these propositions. Examples of such propositions are;

Only adults can enter cinema halls.

Standard form translation: All those who can enter the cinema hall are adults.

None but the citizens can vote.

Standard form translation: All those who can vote are citizens.

Propositions beginning with ‘only’ and ‘none but’ usually translate into A propositions. They follow the general rule of reversing the subject and predicate, and replace ‘only’ with ‘all’. Therefore the form of this translation would be:

Only S is P or None but S’s are P’s

Standard form translation: All P is S.

However, there can be some context in which ‘only’ and ‘none but’ are used to convey some different meaning. “Only S is P” and “None but S is P” can be taken to suggest either that “All S is P” or “Some S is P.” Therefore, we should take into account the context to determine meaning. However, in case we are not presented with any additional information the translations of these propositions should be done into A proposition.

7.11 TRANSLATING ADVERBS AND PRONOUNS

Let us consider the following example:

"The poor always you have with you."

This proposition neither asserts that all the poor are with you, nor even that some poor are with you. If we notice the key word 'always' here this word means 'at all times' and when we use the word 'times' in both subject ad predicate terms we can translate the propositions as "All times are times when you have the poor with you" The word 'times' which appears in both the subject and the predicate terms is used as a 'parameter'. We have shown the requirement and usage of a parameter in the previous sections of the unit.

When a proposition contains a temporal adverb, like, 'when', 'whenever', 'anytime', 'always' or 'never' it can be translated in terms of 'times.'

Smith always wins at billiards.

Standard form translation: All times when Smith plays billiards are times when Smith wins at billiards.

Dogs bark whenever a car passes by.

Standard form translation: All times when a car passes by are times when the dogs bark.

Jones loses a sale whenever he is late.

Standard form translation: All times when Jones is late are times when Jones loses sales.

When a proposition contains a spatial adverb, like, 'where', 'wherever', 'anywhere', 'everywhere', 'nowhere' it might be translated in terms of 'places.' To translate some propositions into standard form, the words 'places' can be introduced as parameters.

Where there is no vision the people perish.

Standard form translation: All places where there is no vision are places where the people perish.

They go where they choose.

Standard form translation: All places they choose are places where they go.

The alarm rings wherever the safe is touched.

Standard form translation: All places where the safe is touched are places where the alarms ring.

Propositions containing pronouns, like, ‘who’, ‘whoever’, ‘anyone’ may be translated in terms of ‘people.’

Whoever works hard will succeed.

Standard form translation: All people who work hard are people who will succeed.

Propositions containing pronouns, like, ‘what’, ‘whatever’, ‘anything’ may be translated in terms of ‘thing.’ All of these propositions are translatable into standard from categorical propositions. Consider the following examples:

Rohan does what he wants.

Standard form translation: All things Rohan wants to do are things Rohan does.

Moreover, we should notice the order of subject and predicate terms in the example. When translating such statements there is a possibility to confuse the subject term with the predicate term. The implicit rule to be followed: For W words (‘who’, ‘what’, ‘when’, ‘where’, ‘whoever’, ‘whatever’, ‘whenever’, ‘wherever’) the language following the “W” word goes into the subject term of the categorical proposition. (Hurley and Watson, 2019, p.263)

7.13 TRANSLATING CONDITIONAL STATEMENTS

In case of a conditional statement if the antecedent and consequent refers to the same class of people or things, then the statement is translated into universal categorical proposition. We have to note that the language which follows ‘if’ goes in the subject term of the categorical proposition, and the language following ‘only if’ goes in the predicate term. Let us consider few examples.

Sweet is tasty if it is made of pure ghee.

Standard form translation: All sweets made of pure ghee are tasty things.

If it is a whale, then it is a mammal.

Standard form translation: All whales are mammals.

If a dog is hungry, then it is dangerous.

Standard form translation: All hungry dogs are dangerous animals.

A meal is tasty only if it is made by mother.

Standard form translation: All tasty meals are meals made by mothers.

Moreover, a conditional statement which has a negated consequent but an affirmative antecedent is translated as E proposition. For example:

If it is a pigeon, then it is not an animal.

Standard form translation: No pigeons are animals.

A motorbike will run at a high speed only if it is not old.

Standard form translation: No motorbikes that run on high speed are old motorbikes.

Also, the word 'unless' means 'if not.' Statements which contain 'unless' are translated as categorical propositions which have negated subjects. For example:

Unless students misbehave they will be treated with respect.

Standard form translation: All students who do not misbehave are students who will be treated with respect.

Check your Progress III

Note: a) Use the space provided for your answer.

b) Check your answers with those provided at the end of the unit.

1. Translate the following statements to standard form propositions.

1. If it's a mouse, then it is a mammal.

2. Jewelry is expensive if it is made of gold.

3. A car is a Camry only if it is a Toyota.

4. If it is not a turkey, then it is not a mammal.

5. Unless a boy misbehaves he will be treated decently.

6. Violence breeds violence.

7. All that glitters is not gold.

8. Children alone are not allowed to enter the cinema hall.

9. If it is a dog, then it is not a bird.

10. Anyone who jumps high sees the heights.

11. None but the brave deserve the fair.

12. Only policemen are indispensable.

13. All except children are allowed to do a job.

14. Almost all police men are at the station.

15. Accountants are the only one who will be hired.

7.14 LET US SUM UP

Propositions, which are not in standard form can be put into standard form following few tips.

- Translation must have a proper quantifier, subject term, copula and predicate term.
- Translate singular propositions by using a parameter.

- Translate adverbs and pronouns by using parameters i.e. “persons”, “places” “things” and “times.”
- Language following “if”, “the only” and W words (“who” “what” “when”“where”, “whoever”, “whatever”, “whenever”, “wherever” goes in the subject term.
- Language following “only if” “only” “none but” “none except” and “no…except” goes in the predicate term.
- Propositions starting with ‘few’, ‘a few’, ‘almost all’, ‘all but a few’, ‘almost everyone’ must be translated as a compound of I and O propositions.
- Propositions of the form ‘All except S is P’ are translated as ‘All non S are P, and no S are P.’

Key word (to be eliminated)	**Translation Hint**
Whoever, wherever, always, anyone, never, etc.	Use “all” together with people, places, times
Few, several, many	Use “some”
If….. then	Use “all” or no”
Unless	Use “if not”
Only, none but, none except, no….except	Use “all”
The only	Use “all”
All but, all except, few	Two statements required
Not every, not all	Use “some….. are not”
There is, there are	Use “some”

Table Source: (Hurley and Watson, 2019, p. 267)

7.15 KEY WORDS

Exclusive Propositions: Propositions that assert that the predicate term applies exclusively only to the subject term.

Exceptive Proposition: Proposition that asserts that all members of some class, with the exception of the member of one of its subclasses, are members of some other class.

Parameter: An auxiliary symbol or phrase introduced to uniformly translate categorical propositions into standard form.

Singular Propositions: A proposition with a unit class, having only one member. Singular propositions assert or deny that the member has some specific attribute.

Standard form Categorical Propositions: Any categorical proposition of the form "All S is P" (universal affirmative), "No S is P" (universal negative), "Some S is P" (Particular Affirmative), "Some S is not P" (particular negative). They are known as A, E, I and O propositions respectively.

7.16 FURTHER READINGS AND REFERENCES

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7.17 ANSWERS TO CHECK YOUR PROGRESS

Check your Progress I

1. All roses are fragrant flowers
2. All skyscrapers are tall buildings
3. All dogs are animals that bark.

4. All pigeons are birds which fly.
5. Reet is a tennis player.
6. No neem leafs are sweet things.
7. Some cars are not spacious vehicles.
8. No insurance policies are policies which give good return claims.
9. All people identical to Rohan are people who are sitting at home or Rohan is a person who is sitting at home.
10. All cats are animals that climb the tree.
11. Some people are not subscribers of educational journals.
12. All things identical to moon are things that are full tonight.
13. All things identical to wine are things that I hate.
14. All ducks are swimmers.
15. Some birds are animals that fly during the winter.

Check your Progress II

1. All textbooks are useful.

2. All logic problems are difficult problems.

3. All tigers are mammal.

4. No fish is a mammal.

5. All children are human beings.

6. Some citizens are not voters.

7. No dogs are cats.

8. Some entertainers are actors.

9. Some sailors are courageous people and some sailors are not courageous people.

10. All students are eligible people.

11. Some students are not resourceful.

12. Some students are persons who are present here.

13. Some politicians are honest beings.

14. All flowers are beautiful things.

15. All emeralds are green gems.

16. Some lions are animals in the zoo.

17. All tigers are mammals.

18. No fishes are mammals.

19. Some tigers are animals that roared.

20. All children are human beings.

21. Some children are people who live next door.

22. All children are naughty.

23. Some players are not physically fit.

24. Some events are not well organized.

25. No parrots are blue things.

Check your Progress III

1. All mice are mammals.

2. All pieces of jewelry made of gold are expensive things.

3. All Camrys are Toyotas.

4. No turkeys are mammals.

5. All boys who do not misbehave are boys who will be treated decently.

6. All acts of violence are violence breeders.

7. Some things that glitter are not gold or Some glittery things are not gold.

8. All non Children are allowed to enter the cinema hall and No children are allowed to enter the cinema hall.

9. No dogs are birds.

10. All people who jump high are people who see the heights.

11. All those who deserve the fair are those who are brave.

12. All indispensible people are policemen.

13. All non children are allowed to do a job and No children are allowed to do a job.

14. Some policemen are at the station and some police men are not at the station.

15. All those who will be hired are accountants.

UNIT 8 SQUARE OF OPPOSITION AND EXISTENTIAL IMPORT*

Structure

8.0 OBJECTIVES

The present unit aims to understand,

- the relations of opposition between the four standard form categorical propositions by the medium of traditional square of opposition as given by Aristotle. From the perspective of Aristotelian logic we have immediate inferences based on the relations in square of opposition. These are of four varieties, namely; Contradictories, Contraries,

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Subcontraries and Subalternation. Given the truth-value of a particular standard form categorical proposition we shall learn the derivation of truth-value of all the other three categorical propositions.

- the difference in interpretations arising in the relation between the propositions in the light of the interventions made by modern logician George Boole to resolve the existing inconsistencies. This analysis shall be undertaken along with an in depth analysis of existential import and various assumptions implied by it.

8.1 INTRODUCTION

In the preceding units we have defined categorical propositions and their kinds. In the present unit we will see that there are relations of opposition between these four standard form categorical propositions. Traditionally, the technical term used to denote this kind of differing is "opposition." It is important to note that the central task of formal logic is to deal with analysis and evaluation of an argument. Validity/ Invalidity of an argument can be tested through inference. These inferences can be of two types; mediate inference and immediate inference. In the present unit we aim to understand how certain preliminary elementary forms of argument can be validated by immediate inference on the basis of relations in Traditional Square of Opposition. In case we are given the truth or falsehood of any one of the four standard form categorical propositions we can immediately infer the truth or falsehood of some or all the other three standard form propositions on the basis of the kind of relation of opposition between them. In the next unit we shall also study further immediate inferences.

8.2 THE TRADITIONAL SQUARE OF OPPOSITION

We have already observed in previous units that Aristotelian logic argued that the standard form categorical propositions, having same subject and predicate terms, might differ either in quality or quantity or both of them. The technical term with which these differences are designated is **opposition**. These different kinds of differences of truth relations that may hold between a pair of categorical statements are represented with the help of an important diagram called **Traditional Square of Opposition.** More specifically defined "opposition" is the logical relation that exists between two contradictories, contraries or other such relations displayed on

Traditional Square of Opposition. This term "opposition" need not denote any apparent disagreement between the propositions. The oppositions are correlated with some very important true relations. There are four possible ways in which the standard form categorical propositions are "opposed" with one another i.e. contradictories, contraries, subcontraries and subalterns and superalterns.

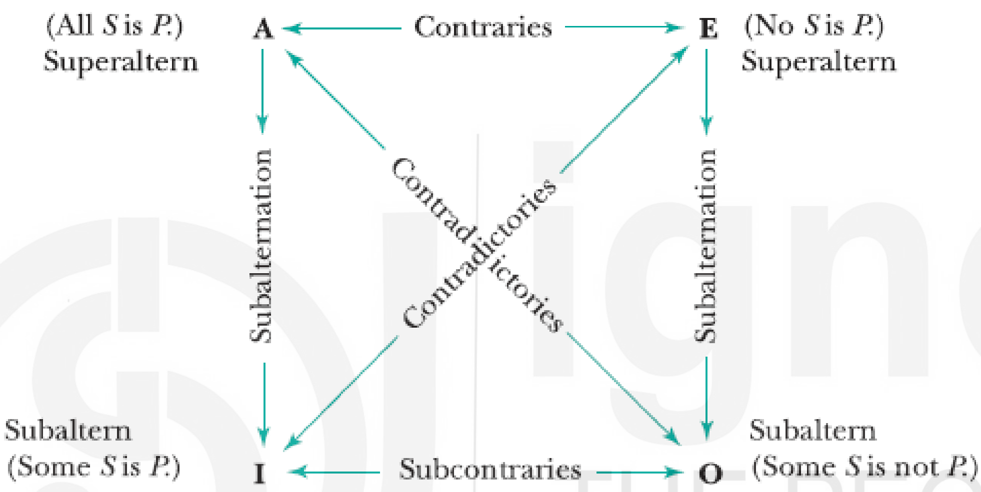

Diagram 1: Traditional Square of Opposition (Source: Copi et al., 2016, p. 114)

8.3 RELATIONS IN TRADITIONAL SQUARE OF OPPOSITION

8.3.1 Contradictories

Two propositions are contradictories when one is the denial or negation of the other proposition. Contradictories cannot both be true and cannot both be false. Two standard form categorical propositions that have the same subject and same predicate terms but differ from each other in both quality and quantity are contradictories. An A proposition, "All lawyers are accountants" and O proposition, "Some lawyers are not accountants" are contradictories. The reason is that they are opposed in both quantity (A refers to 'all' and O refers to 'some') and quality (one affirms, the other denies).We gather that out of the two exactly one is true and another is false. Similarly, the E proposition, "No lawyers are accountants" and I proposition, "Some lawyers are accountants" are contradictories as they are opposed to each other in both quantity and quality. Out of the two "A and I" and "E and O" one is true and the other is false. They can both be neither true nor false together.

"All S is P" is contradicted by "Some S is not P."

"No S is P" is contradicted by "Some S is P."

8.3.2 Contraries

Two propositions are said to be contraries if they cannot both be true together. In contrary propositions the truth of one entails the falsity of the other. However, both the propositions can be false. Let us take example of a one-day cricket match to be held between India and Australia. In the context of a match between two teams, the two propositions "India will win the upcoming game with Australia" and "Australia will win the upcoming game with India" are contraries. This implies that if one of the two statements is true then the other statement has to be false. However, if the result of the cricket match turned out to be a draw then both of these statements would be false. Therefore, these two propositions cannot both be true together however they can both be false. Unlike contradictories contraries can both be false.

Furthermore, let us figure out contraries among the four standard form categorical propositions. The traditional account of categorical propositions argues that the universal propositions (A and E) which have the same subject and same predicate terms but differ only in quality (one affirms and another denies) are contraries. Universal affirmative proposition, A "All poets are artists" and its corresponding E proposition "No poets are artists" cannot both be true but both of them can be false and therefore they are regarded as contraries. However, the modern logicians have identified a problem with this traditional Aristotelian interpretation, which shall be discussed in the second half of the chapter under the discussion on Existential Import.

Also, we shall qualify here that the A and E propositions are not taken as necessary propositions but assumed to be contingent i.e. they are neither necessarily true nor necessarily false. This assumption is important to our discussion because in case either A or E proposition is necessarily true i.e. in case either of them is a logical or mathematical truth, like, "All tautologies are true" or "No circles are rectangles" the claim that A propositions and E propositions are contraries cannot be correct. A necessarily true proposition cannot be false by definition and therefore it cannot have a contrary. We have already seen that by definition two propositions can only be contraries if they can both be false. We shall assume that according to the present interpretation the propositions are contingent so that we may correctly hold the claim that A and E propositions, which have the same subject and predicate terms are contraries (Copi et al., 2016, p.113).

8.3.3 Subcontraries

Two propositions are subcontraries when they cannot both be false, although they may both be true. The traditional account suggests that particular propositions (I and O), which have the same subject and predicate term but which differ from each other in quality (one affirms and another denies) are subcontraries. Particular affirmative proposition, 'Some dogs are pets' and particular negative proposition 'Some dogs are not pets' could both be true but they could not both be false and therefore are subcontraries.

Also, on the lines of the assumption made for contraries we shall qualify here that I and O propositions are assumed to be contingent i.e. they are neither necessarily true nor necessarily false. This assumption is important to our discussion because in case I or O proposition is necessarily false; like, "Some squares are triangles" or "Some triangles are not three-sided structures" the claim that I propositions and Opropositions are subcontraries cannot be correct. A necessarily false proposition cannot be true by definition and therefore it cannot have a subcontrary. We have already seen that by definition two propositions can only be subcontraries if they can both be true. We shall assume that according to the present interpretation the propositions are contingent so that we may correctly hold the claim that I and O propositions, which have the same subject and predicate terms, are subcontraries.

8.3.4 Subalteration

The relation of subalteration exists between two propositions when two categorical propositions, which have the same subject and predicate terms, agree in quality but differ in quantity. Since they agree in quality they are also called corresponding propositions i.e. A proposition "All dogs are mammals" has a corresponding proposition "Some dogs are mammals." Similarly, "No whales are reptiles" has a corresponding proposition, "Some whales are not reptiles". This relation holds between a universal statement and its corresponding particular statement. Subalteration is the relation of opposition between a universal proposition and its corresponding particular proposition. In these pair of corresponding propositions the universal propositions (A and E) are called superaltern and the particular propositions (I and O) are called subaltern respectively. Hence logically, the superaltern proposition implies the truth of subaltern proposition but not vice-versa.

For instance, from the universal affirmative proposition, "All spiders are eight-legged creatures" the particular affirmative subaltern proposition, "Some spiders are eight-legged creatures" follows. If A is true the corresponding E proposition is true. Similarly, from the universal negative proposition, "No spiders are eight-legged creatures" the particular negative proposition, "Some spiders are not eight-legged creatures" follows. If E is true the corresponding O proposition is true. However, the reverse does not hold i.e. if the particular proposition is true then the respective universal proposition is undetermined.

Moreover, in case I proposition is given as false then corresponding A proposition is also false and if O proposition is given as false then its corresponding E proposition is also false. However, the reverse does not hold i.e. if the universal proposition is false then the respective particular proposition is undetermined. We shall learn about the immediate inferences, which follow from the relations in the traditional square of opposition in the upcoming section.

Check your Progress I

Note: a) Use the space provided for your answer.

b) Check your answers with those provided at the end of the unit.

A. State the contradictory of the following propositions:

1. All politicians are liars.
2. Some grapes are not sour.
3. All elephants are vegetarian.
4. Some soldiers are not officers.

B. State the contrary of the following propositions:

1. All women are authors.
2. No whales are fishes.
3. All surgeons are physicians.
4. No trees are machines.

C. State the subcontrary of the following propositions:

1. Some knives are sharp.
2. Some animals are not cats.
3. Some spiders are not eight-legged creatures.
4. Some books are thick.

D. State the superaltern of the following propositions:

1. Some games are inventions.
2. Some pilots are trained professionals.
3. Some books are thick.
4. Some boxes are heavy.

E. State the subaltern of the following propositions:

1. All masks are protection devices.
2. All bananas are fruits.
3. All phones are communication devices.
4. All bottles are containers.

8.4 IMMEDIATE INFERENCES: FROM TRADITIONAL SQUARE OF OPPOSITION

On the basis of relations of oppositions presented in the traditional square of opposition we can draw several immediate inferences. To the present purpose we should start by differentiating between immediate and immediate inferences. In case of mediate inference we draw a conclusion from one or more premises. For example in categorical syllogisms wherein two premises imply conclusion, in such cases the conclusion is drawn from first premise through the mediation of the second. This inference shall be explored in the upcoming block. On the other hand when a conclusion is drawn from only one premise there is no need for mediation of the second premise and such inferences are called immediate inferences. We can draw many immediate inferences on the basis of Traditional Square of Opposition. If we are given the truth value of any of the four standard form categorical statements we can make immediate inference about the truth value of the other propositions. However, it is important to observe that in some cases the immediate inference will yield a definite conclusion and in some other cases it may yield to inconclusive answers.

In the previous unit we have understood the relations of opposition in Traditional Square of Opposition individually. Let us now see how these relations can be used to determine the truth-values of corresponding propositions. To find out truth-value of more than one proposition based on a given proposition, as a rule of thumb we can first use the relation of contradiction. Suppose the value of "All policemen are honest beings" is given as true. First, by contradiction relation we decide "Some policemen are not honest beings" is false. The truth-value of the rest of the statements can be determined by evoking other relations successively. Second, rule of thumb is that when one statement has logically undetermined truth-valuethen its contradictory statement also has logically undetermined truth-value. (Hurley and Watson, 2019, p. 241-242)

The truth-values can be determined through various routes. One such way is suggested below. However, we can seek help of other relations to reach the same results. Let us consider the following:

1. In case A is given as true: By relation of contradiction O must be false.

   By relation of subalteration I must be true.

   By relation of contrary E must be false.

2. In case E is given as true: By relation of contradiction I must be false.

   By relation of subalteration O must be true.

   By relation of contrary A must be false.

3. In case I is given as true: By relation of contradiction E must be false.

   By the relation of subalteration from the truth of the particular proposition I nothing would follow about the truth-value of the universal proposition therefore A is undetermined; it may be true or it may be false.

   By the relation of subcontrary both I and O can be true together and the truth of I does not stop O from being false, therefore the O is undetermined; nothing conclusive can be said it may be true or it may be false.

4. In case O is given as true: By relation of contradiction A must be false.

   By the relation of subalteration from the truth of the particular proposition O nothing would follow about the truth value of the universal proposition therefore E is undetermined; it may be true or it may be false.

   By the relation of subcontrary both I and O can be true together and the truth of O does not stop I from being false, therefore the I is undetermined; nothing conclusive can be said it may be true or it may be false.

5. In case A is given as false: By relation of contradiction O must be true.

   By the relation of contrary both A and E can be false together. From the falsity of A it does not follow that E must be true nor it follows that E must be false. Therefore, E is undetermined.

   By the relation of subaltern, the falsity of A neither implies that I must be false nor that it must be true. Therefore, I is undetermined.

6. In case E is given as false: By the relation of contradiction I must be true.

   By the relation of contrary both A and E can be false together. From the falsity of E it neither follow that A must be true nor it follows that A must be false. Therefore A is undetermined.

By the relation of subaltern, the falsity of E neither implies that O must be false nor that it must be true. Therefore, O is undetermined.

7. In case I is given as false: By the relation of contradiction E must be true.

   By the relation of subalternationA must be false.

   By the relation of subcontrary O must be true.

8. In case O is given as false: By the relation of contradiction A must be true.

   By the relation of subalternation E must be false.

   By the relation of subcontrary I must be true.

Check your Progress II

Note: a) Use the space provided for your answer.

b) Check your answers with those provided at the end of the unit.

A. If A proposition "All policemen are honest" is true what can be inferred about the truth or falsity of the following propositions:

1. No policemen are honest.

2. Some policemen are honest.

3. Some policemen are not honest.

B. If E proposition "No policemen are honest" is true what can be inferred about the truth or falsity of the following propositions:

1. All policemen are honest.

2. Some policemen are honest.

3. Some policemen are not honest.

C. If I proposition “Some policemen are honest” is true what can be inferred about the truth or falsity of the following propositions:

1. All policemen are honest.

2. No policemen are honest.

3. Some policemen are not honest.

D. If O proposition “Some policemen are not honest” is true what can be inferred about the truth or falsity of the following propositions:

1. All policemen are honest.

2. No policemen are honest.

3. Some policemen are honest.

E. If A proposition “All policemen are honest” is false what can be inferred about the truth or falsity of the following propositions:

1. No policemen are honest.

2. Some policemen are honest.

3. Some policemen are not honest.

F. If E proposition “No policemen are honest” is false what can be inferred about the truth or falsity of the following propositions:

1. All policemen are honest.

2. Some policemen are honest.

3. Some policemen are not honest.

G. If I proposition “Some policemen are honest” is false what can be inferred about the truth or falsity of the following propositions:

1. All policemen are honest.

2. No policemen are honest.

3. Some policemen are not honest.

H. If O proposition “Some policemen are not honest” is false what can be inferred about the truth or falsity of the following propositions:

1. All policemen are honest.

2. No policemen are honest.

3. Some policemen are honest.

I. For each of the following questions, given the truth-value of one of the four types of categorical propositions, determine the truth-values of the other three categorical propositions. Use your understanding from Traditional Square of Opposition to determine the correct answer.

1. If A proposition is T then what can you conclude about E proposition.
2. If A proposition is T then what can you conclude about I proposition.
3. If A proposition is F then what can you conclude about O proposition.
4. If A proposition is F then what can you conclude about I proposition.
5. If E proposition is F then what can you conclude about I proposition.
6. If E proposition is F then what can you conclude about O proposition.

7. If E proposition is T then what can you conclude about A proposition.
8. If E proposition is T then what can you conclude about O proposition.
9. If O proposition is T then what can you conclude about E proposition.
10. If O proposition is T then what can you conclude about A proposition.
11. If O proposition is F then what can you conclude about I proposition.
12. If O proposition is F then what can you conclude about E proposition.
13. If I proposition is T then what can you conclude about A proposition.
14. If I proposition is T then what can you conclude about O proposition.
15. If I proposition is F then what can you conclude about E proposition.
16. If I proposition is F then what can you conclude about A proposition.

8.5 EXISTENTIAL IMPORT

Existential import is that attribute of a categorical proposition, which asserts the existence of objects. A proposition having existential import asserts the existence of objects i.e. the class designated by the subject term of the categorical proposition is assumed to have at least one member. In other words the categorical propositions have existential import when the class designated by the subject term is non-empty. The classical logicians of Aristotelian tradition argue that all four categorical propositions A, E, I, and O have existential import. However, the modern logicians agree that I and O have existential import but they disagree with Classical logicians and do not attribute existential import to A and E propositions. Along with other references mentioned in the chapter I have mainly referred to *Introduction to Logic* (Copi et al., 2016) for the present and following sections.

The issue at hand is to be decided with utmost care. A student of logic is concerned with the correctness/incorrectness of reasoning. It is assumed that evaluation of validity/invalidity of an argument and correctness of reasoning in many arguments depends on the fact that whether the propositions, which constitute that argument, have existential import or not i.e. they have members or not. We have already seen that categorical propositions are preliminary units or building blocks of arguments. Along with translating ordinary language propositions in standard form and symbolizing the A, E, I and O propositions, we shall also guard ourselves against any incorrect inferences by establishing what is asserted or denied by the proposition about class membership. It is important to understand the resolution of the controversy of existential import in order to explore how we can develop a coherent analysis of a categorical syllogism.

Modern logicians argue that particular propositions I and O always have existential import. Let us understand the reasons they give for this claim by the help of examples:

Some animals are reptiles.

Some dogs are not pets.

The first proposition, "Some animals are reptiles" asserts that there exists at least one animal which is a reptile. Also the second proposition, "Some dogs are not pets" asserts the existence of some dogs or at least one dog and additionally asserts that those dogs or that one dog is not a pet. In both I and O propositions the classes designated by the subject terms are not empty. If these propositions are true then both the class of "animals" as well as the class of "dogs" each has at least one member. We shall see the interpretation of particular propositions in more detailed manner in the coming section.

However, in the history of logic, whether the universal propositions, A and E, have existential import or not is a matter on which there is no consensus. To understand the matter at hand we should begin by asking the primary question, when can we reasonably conclude that something exists? The modern logicians would answer that until we have definite evidence it is not logically justified to assume existential import. Let us understand why the traditional logicians believe that universal propositions have existential import while modern logicians deny it. For example:

A: All unicorns are horned creatures.

E: No inhabitants of moon are honest beings.

According to traditional logicians these two statements A and E have existential import i.e. the subject terms "unicorns" and "inhabitants of moon" refer to non-empty classes. But we know that there are no "unicorns" or "inhabitants of moon.""Unicorn" is a fictional character and "inhabitant of moon" might be a possibility in distant future but it definitely is an empty class at present. Now the problem arises when we consider the consequences of the assumption of traditional logicians that A and E propositions mentioned above have existential import i.e. do have members. According to Traditional Square of Opposition two propositions are contradictories when only one of the propositions in the pair can be false at a time. But if we consider that the contradictory propositions, "All inhabitants of moon are honest beings" and "Some inhabitants of moon are not honest beings" have existential import i.e. there are "inhabitants of moon" then both these propositions would be false if it is the case that moon has no inhabitants. We know through our factual knowledge that the subject class i.e. the class of "inhabitants of moon" is empty therefore both the propositions are false. The problem arises that if we assume that universal propositions (in this case proposition A) have existential import then the relation of contradiction does not seem to hold in the Traditional Square of Opposition. If we assume existential import in the cases discussed above then both the propositions cannot be contradictories because in the contradiction relation only one of them can be false at a time.

We wonder how to explain the incompatible relations. The issue here is that we have a choice between preserving the relation of contradiction in Traditional Square of Opposition and preserving the traditional assumption of existential import and only one of them can hold in the existing situation. Another issue is that Traditional Square of Opposition claims that I follows validly from A through relation of subalteration. Similarly, O follows validly from E through the relation of subalteration. But for I and O to follow validly from A and E propositions A and E should have existential import. Otherwise how can a proposition without existential import validly imply a proposition, which has existential import from proposition, which does not have existential import. As from a claim to non-existence it would be inconsistent to move towards a claim to existence.

In order to rescue the relations in traditional square of opposition the concept of existential presupposition is introduced. We begin with a presupposition that all categorical propositions A, E, I and O refer to classes which have members and they are not empty. We make a blanket presupposition that all classes designated by our terms do have members i.e. we presuppose that the classes to which categorical propositions refer have members and they do not refer to empty classes. In this way all the relationships in Traditional Square Opposition are rescued.

- A and E remain contraries.
- I and O remain subcontraries.
- Subaltern I follows from superaltern A.
- Subaltern O follows from superaltern E.
- A and O remain contradictories.
- E and I remain contradictories.

The existential import is a presupposition, which is sufficient as well as necessary to rescue Aristotelian logic as well as traditional square of opposition. Even the ordinary use of modern languages, like, English makes this presupposition. For example, on being told, "All the masks on the table are made of cotton" we assume that the subject class is non-empty. We assume the existence of masks. However, if on observation we were to find out that there are no masks on the table then we would assume that the speaker has made a mistake i.e. in this case the existential presupposition about existence of masks was false. We would not argue that the claim is false or true. This shows that in general usage of language we do understand and accept the existential presupposition of propositions (Copi et al., 2016, p. 128-129).

Although we preserve the traditional relations in the square of opposition but this blanket assumption has other limitations. The blanket presupposition imposes heavy intellectual penalties. If we presuppose that the class designated by all categorical propositions has members then the question confronts us- Will we ever be able to formulate the proposition that denies the existence or denies that the class has members? It also curtails our power of expressing categorical propositions, which express empty classes. Furthermore, there are times when we utter propositions with the intention of using the term to designate empty classes. For example, when the Traffic Department makes a rule, "All those who break the traffic rules their driving license would be cancelled" they do not presuppose that "the class of those who break the traffic rules" should have members. Instead the intention of traffic department would be that the class would become and remain empty. Also, this statement would be taken as true even if no one were ever prosecuted. The word “all” in this statement might be assumed to refer to an empty class. Mostly, we make rules and laws intending the subject class to be empty.

Also, another limitation is that we would never be able to make statements about empty classes like, “All yellow zebras are creatures that have giraffe necks” and many others, which are statements made about hypothetical classes with possible characterizations in fictional works.

At times, we reason about theoretical entities without making any commitment about their existence, especially in case of scientific principles. Most of the times in science we refer to concepts like, points, lines, bodies at rest, bodies not acted upon, plane, frictionless, ideal gases, planets and several other conjectural entities. However, the scientists or mathematicians assume them hypothetically and do not necessarily want to commit that these entities actually physically exist.

4.6 BOOLEAN INTERPRETATION AND THE SQUARE OF OPPOSITION

For the above mentioned and other such reasons, George Boole and other modern logicians suggested that it is better to restrict existential import only to I and O propositions.* According to Boolean interpretation we make following claims:

- A and E do not have existential import.
- Only I and O statements have existential import.

On Boolean interpretation we commit an existential fallacy if we assume existence (a class has members) where we do not have clear evidence to claim existence. If an argument relies on this mistake it commits the fallacy of existential assumption or existential fallacy. Therefore, we cannot assume the existence of individuals in the subject term of universal propositions.

*Patrick J. Hurley clarifies that it was not George Boole but John Venn who eliminated existential import from universal propositions. In the book *Symbolic Logic* John Venn insisted that universal propositions should be interpreted as having no existential import. This modification by Venn is what is accepted as official Boolean position known to us. For more details on this please refer (Hurley, 2019, p. 226-227).

The modern interpretation argues that a conditional statement, which makes no assertion concerning the existence of members in a class, designates universal propositions. On Boolean interpretation there is no assumption that in the propositions mentioned below the class of either "men" or "unicorn" or "mangoes" or "dogs" is a non-empty class. According to Boolean interpretation the universal statement A is written as the conditional of the following type:

For any x, if x is S then x is P.

Let us take examples of universal proposition A and E with their modern interpretation:

"All men are mammals" would mean "for any x, if x is a man then x is a mammal"

"All unicorns are mammals" would mean "for any x, if x is a unicorn then x is a mammal"

"No mangoes are yellow objects" would mean "for any x, if x is a mango then x is not yellow object"

"No dogs are cats" would mean "for any x, if x is a dog then x is not a cat"

We see that none of these conditional statements make any assertion concerning the existence of members of a class. However, according to Boolean interpretation unlike "all" in universal propositions, the word "some" in an I proposition makes the claim that there is a membership in the subject class. "Some" is interpreted to mean "at least one." Therefore if particular propositions are true then subject class is not empty because particular propositions are analyzed as conjunction with an existential claim. For example,

"Some roses are beautiful" would mean "There is at least one x such that x is a rose and x is beautiful"

However, we should note that in the Boolean interpretation there is no claim to membership in subject class of universal propositions. If "unicorn" is the subject and there are no members in the subject class (subject being empty) then both the propositions "No S is P" as well as "All S is P" can be true. Also, If there are no unicorns, then I proposition, "Some unicorns are horned creatures" and O proposition, "Some unicorns are not horned creatures" are both false.

What we witness is that the Boolean interpretation results in an important shift in the relations of opposition in Traditional Square of Opposition.

1. Since A and E do not have existential import and I and O do have existential import therefore the relation of subalternation does not hold in modern interpretation. It will be an existential fallacy to infer a statement, which has existential import from premises, which do not have existential import. From the truth of universal propositions we cannot follow the truth of particular propositions.
2. The relation of contraries does not hold for corresponding A and E propositions. If there are no "inhabitants of moon" then both the propositions "All inhabitants of moon are honest beings" and "No inhabitants of moon are honest beings" can be true. We have seen above that both A and E would be written as conditional propositions "if thereis an inhabitant of moon then it is an honest being" and "if there is an inhabitant of moon then it is not an honest being" and conditional can both be true together if there is no member in the subject class.
3. Similarly the relation of subcontraries does not hold for corresponding I and O propositions. In case the subject class turns out to be empty then both the corresponding I and O propositions can be false together. Since corresponding I and O propositions have existential import in case there are no "inhabitants of moon" it would be false to assert both "Some inhabitants of moon are honest beings" as well as "Some inhabitants of moon are not honest beings."By traditional definition subcontraries cannot be false together although they may be true. Since by the above analysis we gather that they can be false together therefore the relation of subcontraries does not hold.
4. However, like the traditional square even in modern interpretation universal propositions A and E are the contradictories of the particular propositions O and I. We just noted that if we begin with a presupposition of existence in the case of contradictory propositions A and O and then the subject class turns out to be empty then both the propositions would become false. Thus relation of contradiction would not hold. However, if we accept the modern interpretation then the relation of contradiction holds between A and O as well as E and I(Copi et al., 2016, p.130-131).

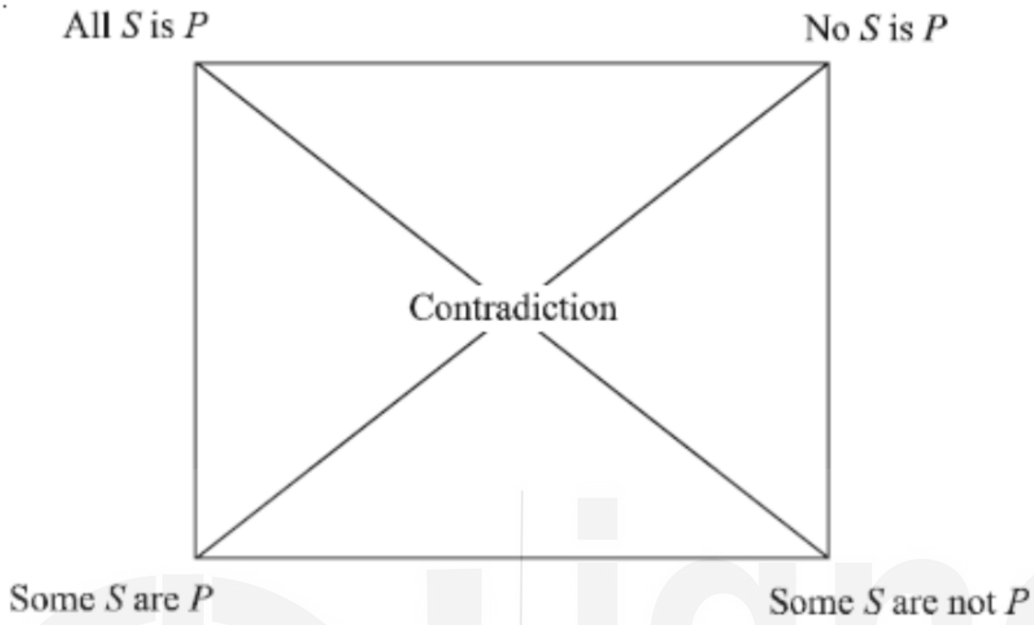

Diagram 2: The Square of Opposition after Boolean Interpretation (Source: Chakraborty, 2006, p. 255)

Since the blanket modern logicians the traditional square of opposition is only left with the relation of contradiction reject existential presupposition. According to Boolean interpretation the relations along the side of the square are undone and only the diagonal relation i.e. contradictory remains. Also, the Boolean interpretation has an impact on further immediate inferences performed by limitation. Since the subalternation relation is not a valid relation in this interpretation therefore conversion by limitation for A proposition is invalid. Also, for the same reason contraposition by limitation for E proposition is invalid. We shall elaborate on this matter in the next unit.

Although Boolean interpretation is not making an assumption of existence in case of universal propositions yet there is a scope to use universal proposition whenever we intend to assert existence. In order to do this we require asserting two propositions i.e. universal as well as particular. The universal proposition, "All human beings on earth are mortal" has no existential import and it makes a limited claim, "if there is a human being on earth then he/she is mortal." In case we claim this proposition and wish to refer to existing human beings then it would have to be asserted as a conjunction of the two. This implies that we would have to assert another particular proposition alongside which intends to assert existence of human beings on earth. Thus we assert, “Ojas is a human being on earth.” Therefore the resultant proposition is a conjunction, “All human beings on earth are mortal” and “Ojas is a human being on earth.” It would take the form, “For any x, if x is a human being then x is mortal, and there is at least an x and x is a human being.”This proposition adds the existential force and refers to actual human beings. Therefore in a universal statement whenever we intend to assert the existence of members of the subject term we will have to add an existential statement separately. According to modern logicians, the impact of Boolean interpretation would hold that only relation of contradiction is valid in square of opposition.

Furthermore, unlike the case of universal propositions, the particular propositions I and O are always assumed to have existential import under both modern as well as traditional interpretations. The issue of existential import pertains only to universal propositions. On the traditional interpretation of universal propositions we need to determine whether or not the subject class denotes things, which actually exist in the world. The question regarding existence is dependent on truth-value. Therefore under traditional interpretation truth-value of a proposition or propositions in an argument play a role in determining validity/invalidity of an argument. However, according to modern interpretation validity/invalidity of an argument is a purely logical concept. (Baronett, 2013, p. 193)

8.7 LET US SUM UP

Immediate inferences based on Traditional Square of Opposition:

A is given as true: E is false; I is true; O is false.

E is given as true: A is false; I is false; O is true.

I is given as true: E is false; A and O are undetermined.

O is given as true: A is false; E and I are undetermined.

A is given as false: O is true; E and I are undetermined.

E is given as false: I is true; A and O are undetermined.

I is given as false: A is false; E is true; O is true.

O is given as false: A is true; E is false; I is true.

8.8 KEY WORDS

Contradictories: When two propositions are related in such a manner that one is the denial or negation of another. A and E are the contradictories of I and O respectively.

Contraries: When two propositions are related in such a manner that although they both may be false but they cannot both be true.

Existential Fallacy: Any mistake in reasoning that arises from assuming illegitimately that some class has members.

Existential Import: An attribute of those propositions that normally assert the existence of objects of some specified kind. Particular propositionsI and O always have existential import. However, Aristotelian and Boolean interpretations of propositions differ on whether universal propositions have existential import or not.

Opposition: The logical relations, displayed on the square of opposition, which exist between any two propositions that differ in quality, quantity or other respects. They are relations between two contradictories, contraries, subcontraries and others.

Square of Opposition: A square shaped diagram, which exhibits logical relations between four types of categorical propositions (A, E, I and O) situated in the four corners.

Subalternation: The relation on square of opposition between auniversal proposition and its corresponding I or O proposition where the particular proposition is called "subaltern" and the universal proposition is called "superaltern.

Subcontraries: When two propositions are related in such a manner that although they may both be true but they cannot both be false.

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8.10 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress I

A. Contradictory:

1. Some politicians are not liars. Since the given proposition is A its contradictory is an O proposition.
2. All grapes are sour. Since the given proposition is O its contradictory is an A proposition.
3. Some elephants are not vegetarian. Since the given proposition is an A proposition its contradictory is an A proposition.
4. All soldiers are officers. Since the given proposition is an O proposition its contradictory is an A proposition.

B. Contrary:

1. No women are authors. Since the given proposition is an A proposition, its contrary is an E proposition.

2. All whales are fishes. Since the given proposition is an E proposition its contrary is an A proposition.
3. No surgeons are physicians. Since the given proposition is an A proposition its contrary is an E proposition.
4. All trees are machines. Since the given proposition is an E proposition its contrary is an A proposition.

C. Subcontrary:

1. Some knives are not sharp. Since the given proposition is an I proposition its subcontrary is an O proposition.
2. Some animals are cats. Since the given proposition is an O proposition its subcontrary is an I proposition.
3. Some spiders are eight-legged creatures. Since the given proposition is an O proposition its subcontrary is an I proposition.
4. Some books are not thick. Since the given proposition is an I proposition its subcontrary is an O proposition.

D. Superaltern:

1. All games are inventions. Since the given proposition is an I proposition its superaltern is an A proposition.
2. All pilots are trained professionals. Since the given proposition is an I proposition its superaltern is an A proposition.
3. All books are thick. Since the given proposition is an I proposition its superaltern is an A proposition.
4. All boxes are heavy. Since the given proposition is an I proposition its superaltern is an A proposition.

E. Subaltern:

1. Some masks are protection devices. Since the given proposition is an A proposition its subaltern is an I proposition.
2. Some bananas are fruits. Since the given proposition is an A proposition its subaltern is an I proposition.
3. Some phones are communication devices. Since the given proposition is an A proposition its subaltern is an I proposition.
4. Some bottles are containers. Since the given proposition is an A proposition its subaltern is an I proposition.

Check Your Progress II

A.

1. E is false (by contrary)
2. I is true (by subalternation)
3. O is false (by contradiction)

B.

1. A is false (by contrary)
2. I is false (by contradiction)
3. O is true (by subalternation)

C.

1. A is undetermined
2. E is false (by contradiction)
3. O is undetermined

D.

1. A is false (by contradiction)
2. E is undetermined
3. I is undetermined

E.

1. E is undetermined
2. I is undetermined
3. O is true (by contradiction)

F.

1. A is undetermined
2. I is true (by contradiction)
3. O is undetermined

G.

1. A is false (by subalternation)
2. E is true (by contradiction)
3. O is true (by subcontrary)

H.

1. A is true (by contradiction)
2. E is false (by subalternation)
3. I is true (by subcontrary)

I.

1. False
2. True
3. True
4. Undetermined
5. True
6. Undetermined
7. False
8. True
9. Undetermined

10. False
11. True
12. False
13. Undetermined
14. Undetermined
15. True
16. False

UNIT 9 IMMEDIATE INFERENCES*

Structure

9.0 OBJECTIVES

In the previous unit we have already understood the concept of immediate inference. Conversion, Obversion and Contraposition are further immediate inferences. In Aristotelian logic, apart from the relations of square of opposition which can serve as the basis for immediate inferences about the truth value of categorical statements, which have the same subject and predicate terms, there are three other kinds of further immediate inferences:

1. Conversion
2. Obversion

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3. Contraposition

The objective of the present unit is,

- to study immediate inferences of Conversion, Obversion and Contraposition for all the four standard form categorical propositions.
- to learn advanced exercises based on an application of combination of relations from traditional square of opposition as well as further immediate inferences under the section “Successive Immediate Inferences.”

9.1 INTRODUCTION

Different interpretations of categorical propositions in the light of presumption and denial of existential import by traditional and modern logicians respectively impacts the validity/invalidity of their conversion/obversion/contraposition. We would develop this understanding in the light of the discussion on existential import and Boolean interpretation in the previous unit. However, it is significant to note that these further immediate inferences are not associated directly with the square of opposition.

9.2 CONVERSION

Conversion is the immediate inference which proceeds by change of position of the terms i.e. interchanging the subject and the predicate terms of a proposition. A standard form categorical proposition is called converse of another proposition when we derive it simply by interchanging the subject and predicate of that proposition. The proposition from which the converse is derived is called convertend. Structure of conversion can be put as follows:

Premise: S is P

Conclusion by conversion: P is S

No change in quality or quantity of the premise is allowed in case of conversion only the change of position of the terms is allowed.

I proposition: Conversion can be safely done for I propositions. Conversion preserves the truth value when it is applied to and gives a reliable valid inference for I statements. For example the converse of the proposition, “Some authors are rich people” is “Some rich people are authors” which is logically equivalent to it. We see that by means of conversion either of them can be inferred validly from the other. Two propositions are logically equivalent propositions.

E proposition: Like the case of I propositions, conversion is valid for E proposition. For example the converse of the proposition, “No authors are rich people” is “No rich people are authors” which is logically equivalent to it. In this case “No authors are rich people” is convertend. We observe that when we convert E or I statement it gives us a new statement that always has the same meaning.

O proposition: The conversion of O propositions is not valid. For example, “Some animals are not pets” is true but its converse the proposition “Some pets are not animals” is false. They are not logically equivalent statements.

A proposition: In case of A propositions we face a special case in view. The converse of A propositions does not follow from its convertend. From “All elephants are mammals” we cannot infer “All mammals are elephants” as clearly they are not logically equivalent and do not carry the same meaning i.e. “All elephants are mammals” is true but from it we cannot infer that “All mammals are elephants” would also be true. Both propositions have unrelated truth value. Thus, conversion is not a reliable process for A statements and does not give rise to logically equivalent statements.

However, traditional Aristotelian logic holds that for A propositions conversion is a valid process. Moreover, for the reasons cited above it suggests that in case of A propositions we perform **conversion by limitation**. This inference is called “conversion by limitation”. We have seen in the previous unit that in Traditional Square of Opposition, we can validly infer from A proposition, “All elephants are mammals” its subaltern I proposition, “Some elephants are mammals.”A proposition says something about ‘all’ members of the subject class the I proposition makes a more limited claim only about ‘some’ members of that class. Therefore, one could infer “Some S is P” from “All S is P.” And once we have an I proposition, “Some S is P” we know that conversion of I proposition is valid i.e. from “Some elephants are mammals” we can easily convert “Some mammals are elephants.” Hence according to traditional logic although conversion for A propositions is valid by limitation but the converse and convertend are not logically equivalent.

In **conversion by limitation** conversion is performed after putting a limitation on the quantity of the given statement. We follow a combination of subalternation and conversion and successfully convert “All S is P” to “Some P is S.” The procedure we follow for conversion of A proposition is as follows:

For a given A proposition, “All elephants are mammals”

Step 1: “Some elephants are mammals” (by subalternation changing the quantity)

Step 2: “Some mammals are elephants” (by conversion interchanging the subject and predicate terms)

It is important to note that according to the modern logic Conversion by limitation is not valid.

S no.	Categorical Propositions	Convertend	Converse
1.	A	All S is P	Some P is S (by limitation)
2.	E	No S is P	No P is S
3.	I	Some S is P	Some P is S
4.	O	Some S is not P	(Conversion not possible)

Table 1: Conversion

9.3 CONCEPT OF CLASS AND COMPLEMENTARY CLASS

As explained in previous units, concept of class can be understood as the collection of all objects that have a certain common attribute, which is the “class-defining characteristic” of all objects belonging to that class. For example the class defining character of all animals would be the characteristic of being animal. The class-defining characteristic is the attribute of being animal.

Every class has a complementary class associated with it. Complementary class of a given class entails the collection of all things that do not belong to the given class. The complement of the class of all animals contains everything else except animals. Complement class of all animals would contain all things like, trains, trees, mountains, rivers and others but cannot contain tigers or elephants as they are animals. Complement of class of all animals is designated as the "class of all non-animals." Usually we attach a prefix "non" to the term. The complement of the term "cat" is "non-cat", the complement of the term "chair" is "non-chair" and so on. The circle represents the class of cats and everything outside the circle represents the class of non-cats.

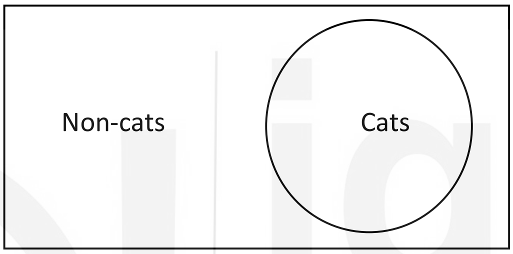

Figure 1: Venn diagram for representation of relationship between class and complementary class

Furthermore, we should note that the complement of the term "animal" is "non-animal" but the complement of the term "non-animal" is not written as "non-non-animal" but simply as "animal". Also, we have to be cautious and should not mistake contrary terms for complementary terms. The contrary of the term "coward" is "hero" but its complementary is "non-coward." The reason is that not everyone is either coward or hero but absolutely everyone is either coward or non-coward.

9.4 OBVERSION

The process of obversion requires two steps:

Step 1: First, we reverse the quality of the given statement. That is, if it is affirmative then we should change it into negative and if it is negative then we should change it into affirmative.

Step 2: Second, we replace the predicate term by its complementary term.

It is important to note that both the subject term and the quantity of the proposition to be obverted remain unchanged. Neither the subject nor the predicate terms are interchanged nor is universal proposition changed into particular or vice-versa.

It is advisable for the beginners to practice obversion in two steps. However, once we have practiced and are well versed with the process we can combine the steps and do obversion in one single step.

A proposition: "All dogs are animals"

Step 1: No dogs are animals. (Changing the quality)

Step 2: No dogs are non-animals. (Replacing the predicate term by complementary term)

E proposition: "No dogs are animals"

Step 1: All dogs are animals. (Changing the quality)

Step 2: All dogs are non-animals. (Replacing the predicate term by complementary term)

I proposition: "Some dogs are animals"

Step 1: Some dogs are not animals. (Changing the quality)

Step 2: Some dogs are not non-animals. (Replacing the predicate term by complementary term)

O proposition: "Some dogs are not animals"

Step 1: Some dogs are animals. (Changing the quality)

Step 2: Some dogs are non-animals. (Replacing the predicate term by complementary term)

The obverse of A proposition is an A proposition; the obverse of an E proposition is an E proposition; the obverse of an I proposition is an I proposition and the obverse of an O proposition is an O proposition. The proposition which serves as premiss is called obvertend and the conclusion is called obverse. Furthermore, obversion is always a valid form of immediate inference when it is applied to any standard form categorical proposition i.e. A, E, I and O. Obversion of all four standard form categorical propositions gives rise to logically equivalent propositions.

S no.	Categorical Propositions	Obvertend	Obverse
1.	A	All S is P	No S is non P
2.	E	No S is P	All S is non P
3.	I	Some S is P	Some S is not non P
4.	O	Some S is not P	Some S is non P

Table 2: Obversion

9.5 CONTRAPOSITION

Contraposition as an immediate inference requires the first two processes i.e. conversion and obversion. To form the contrapositive of a given proposition we follow two steps:

Step 1: We convert the statement by reversing the subject and the predicate terms.

Step 2: We replace both terms by their complementary terms.

In other words we can say that the contrapositive of a given proposition is formed by replacing its subject term with the complement of its predicate term and replacing its predicate term with the complement of its subject term.

A proposition: The contraposition of the A proposition, “All cats are pets” is the A proposition, “All non-pets are non-cats.” On a closer reflection they are logically equivalent to one another. When we apply contraposition of A propositions we form a valid form of immediate inference as it gives rise to logically equivalent propositions. Also, there is another way through which we can get contraposition; by first obverting then converting and then again obverting it again. Given “All cats are pets” we require performing three steps to give a contraposition. These steps are laid out as follows:

Step 1: Obvert to “No cats are non-pets”

Step 2: Convert to “No non-pets are cats”

Step 3: Obvert to “All non-pets are non-cats”

O proposition: On the lines of A proposition the contraposition of an O proposition is a valid immediate inference as O proposition and its corresponding contrapositive O proposition are logically equivalent to each other. For example the contraposition of “Some cats are not pets” is “Some non-pets are not non-cats” as it introduces no new information. Given “Some cats are not pets” we take the following steps:

Step 1: Obvert to “Some cats are not non-pets”

Step 2: Convert to “Some non-pets are cats”

Step 3: Obvert to “Some non-pets are not non-cats”

I proposition: For I propositions contraposition is not a valid form of inference as the contrapositive of I proposition is not logically equivalent to it. For example the contrapositive of “Some cats are pets” is “Some non-pets are non-cats”, which does not have the same truth value and meaning as the given proposition. If “Some cats are pets” is true then “Some non-pets are non-cats” is false. The reason for contraposition being invalid is that when we obvert I proposition we get an O proposition and we have already seen that the converse of O proposition does not follow validly from it. Given “Some cats are pets” we take the following steps:

Step 1: Obvert to “Some cats are not non-pets”

Step 2: Conversion not possible

E proposition: Like the case of O propositions, the contraposition for E propositions does not validity follow from the original. If we take “No cats are pets” as true then “No non-pets are non-cats” would be false. The reason is that when we try to apply the successive steps of first obversion then conversion and then obversion we find that in the first step we obvert E proposition to A proposition but we have already seen that the conversion of A propositions is possible only by limitation. In the third step we can obvert the converted proposition and attain contraposition by limitation. Given “No cats are pets” we take the following steps:

Step 1: Obvert to “All cats are non-pets”

Step 2: Convert to “Some non-pets are cats” (by limitation)

Step 3: Obvert to “Some non-pets are not non-cats” (Contraposition by limitation)

Contraposition of E proposition is valid by limitation. We have already seen in the section on conversion that A propositions are converted by limitation. Here a particular proposition is inferred from a universal proposition and therefore it cannot be logically equivalent to the proposition that was the original premise. Hence the resulting contrapositive premiss would not have the same meaning.

During the procedure of contraposition, as illustrated in the table, we neither change the quality nor the quantity of the original proposition. The contraposition of A proposition is an A proposition, contraposition of E proposition is E proposition and so on. It is important to note that according to modern logic contraposition by limitation is invalid.

S no.	Categorical Propositions	Premise	Contraposition
1.	A	All S is P	All non-P is non-S
2.	E	No S is P	Some non-P is not non-S (by limitation)
3.	I	Some S is P	Contraposition not valid
4.	O	Some S is not P	Some non-P is not non-S.

Table 3: Contraposition

9.6 SUCCESSIVE IMMEDIATE INFERENCES

Immediate inferences play a role in enhancing our knowledge. In Aristotelian logic we can use these inferences by repeatedly applying three immediate inferences of conversion, obversion and contraposition along with the immediate inferences based on Traditional Square of Opposition namely, Contradiction, Contrary, Subcontrary and Subalternation.

In order to find out whether a logical relation exists between two categorical propositions we can use these seven logical relations. Immediate inferences can help us resolve an issue like, in case we are presented with truth value of a statement what can we derive about the truth value of another given statement. For example:

Given that “No doctors are engineers” is true what can we infer about the truth-value of “Some non-engineers are doctors”.

Solution:
Step 1: Obvert to “All doctors are non-engineers” True by obversion
Step 2: Convert to “Some non-engineers are doctors” True by (conversion by limitation).

Given that “All voters are citizens” is true what can we infer about the truth value of “No non-voters are non-citizens.”

Solution:
Step 1: Contraposition to “All non-citizens are non-voters” True by contraposition.
Step 2: Convert to “Some non-voters are non-citizens” True by (conversion by limitation).
Step 3: If “Some non-voters are non-citizens” is true then “No non-voters are non-citizens” is false by contraposition.

There are several rules of thumb we can follow to understand these immediate inference which require us to use our learning from relations of traditional square of opposition as well as further immediate inferences. We should first look for exact match between subject and predicate of the two propositions; given and target propositions. In case there are differences between the two statements we should note which kind of differences exist. If the difference between the given and target propositions is of one complementary class then we can use obversion. If there is a difference in positioning of both the complementary terms we should explore the possibility of contraposition. If difference is of exchange of positions of subject and predicate terms then we can use conversion. Once we are able to arrive at the right match of subject and predicate terms in both the given propositions then we use the square of opposition to infer the truth value of the target statement in comparison with the truth value of the given statement. In cases where we cannot determine the truth value of the target statements by this process we would put the truth value as undetermined for our answer. As an action plan we should first try to get the subject and the predicate terms in the right order because unless two propositions do not have the same subject and same predicate terms there can be comparison among their truth values using traditional square of opposition. Secondly, we should try to eliminate the complementary terms by using immediate inferences of obversion and contraposition wherever applicable.

Also, in case the given proposition is false then we should begin drawing immediate inferences from either

1. Contradictory of the given proposition as contradictory of a false proposition would be true and therefore all valid inferences from that will also be true propositions.
2. From the target proposition itself as it would imply the proposition that is given as false and therefore all valid inferences from that will also be false propositions.(Copi et al., 2016, p. 121)

However, it is significant to note that as observed in the previous unit the Boolean interpretation has an impact on immediate inferences by limitation. Since the subalternation relation is not a valid relation in this interpretation therefore conversion by limitation for A proposition is invalid. For the same reason contraposition by limitation for E proposition will be invalid. The impact of Boolean interpretation for immediate inferences can be summed up as follows:

Conversion is valid for E and I.

Contraposition is valid for A and O.

Observion is valid for all propositions.

Conversion by limitation and contraposition by limitation is not valid.

Moreover, for the purpose of present block we are following the traditional Aristotelian logic and its explanation. Any reference to Boolean interpretation pertains to modern logic, which would be explored in the upcoming blocks of the course.

Check your Progress I

Note: a) Use the space provided for your answer.

b) Check your answers with those provided at the end of the unit.

A. State converses of the following propositions. Also, indicate which of them are logically equivalent to the given propositions:

1. No umpires are partisans.
2. Some metals are conductors.
3. Some nations were not belligerents.
4. All dogs are animals.
5. Some animals are dogs.
6. Some women are writers.
7. All scientists are philosophers.
8. Some cats are pets.
9. No sinners are saints.
10. No non-artisans are professionals.

B. State obverses of the following propositions. Also, indicate which of them are logically equivalent to the given propositions:

1. No circles are polygons.
2. No radicals are students.
3. Some officers are soldiers.
4. No scholarship holders are students.
5. All non-students are non brave.
6. All red things are roses.
7. No roses are non-red things.
8. Some students are not non-brave.

9. No giraffes are short-necked.
10. No men are angels.

C. State the contrapositives of the following propositions. Also, indicate which of them are logically equivalent to the given propositions:

1. Some brave persons are not students.
2. No mortals are men.
3. All cats are mammals.
4. Some poets are not idealists.
5. All saints are polite.
6. Some professors are not good orators.
7. All dogs are intelligent beings.
8. All cats are mammals.
9. Some soldiers are officers.
10. No saints are martyrs.

D. If "All saints are pessimists" is true what can be inferred about the truth and falsehood of the following propositions? Which would be true, false or undetermined?

1. No saints are non-pessimists.
2. Some saints are not pessimists.
3. All non-saints are non-pessimists
4. Some non-pessimists are saints.
5. No non-pessimists are non-saints.

F. If "No pirates are merchants" is true what can be inferred about the truth and falsehood of the following propositions? Which would be true, false or undetermined?

1. All pirates are merchants
2. Some non-merchants are non-pirates.
3. Some non-pirates are non-merchants.
4. Some non-merchants are pirates.
5. All merchants are pirates.

G. If "Some dogs are pets" is true what can be inferred about the truth and falsehood of the following propositions? Which would be true, false or undetermined?

1. Some pets are dogs.
2. Some non-pets are dogs.
3. No non-dogs are pets.
4. All dogs are non-pets.
5. Some dogs are not non-pets.

H. If "Some animals are not cats" is true what can be inferred about the truth and falsehood of the following propositions? Which would be true, false or undetermined?

1. No animals are cats.
2. No animals are non-cats.
3. All non-cats are non-animals.
4. Some non-cats are animals.
5. Some animals are non-cats.

9.7 LET US SUM UP

Validity/Invalidity of Immediate Inferences according to Traditional Logic:

Immediate Inference	**Validity**
Conversion	Valid for E and I Invalid for O Valid by limitation for A
Obversion	Valid for A, E , I and O

Contraposition	Valid for A and O Invalid for I Valid by limitation for E

Validity/Invalidity of Immediate Inferences according to Modern Logic:

Immediate Inference	Validity
Conversion	Valid for E and I, Invalid for A and O
Obversion	Valid for A, E, I and O
Contraposition	Valid for A and O, Invalid for E and I

9.8 KEY WORDS

Complementary Class: The collection of all things that do not belong to a given class.

Contraposition: Firstly, we replace the subject term by the complement of its predicate term. Second, we replace the predicate term by the complement of its subject term. However, it is not a valid form of immediate inference for all types of propositions.

Conversion: To form the converse of a proposition the subject and predicate terms are simply interchanged. The original proposition is called "convertend" and the resultant proposition is called "converse." However, it is not a valid form of immediate inference for all types of propositions.

Immediate Inferences: An inference which is drawn from one premise without the mediation of another premise.

Obversion: We first change the quality of a proposition from affirmative to negative, or from negative to affirmative. Second, we replace the predicate term with its complement. The original proposition is called the "obvertend" and the resultant proposition is called "observe." It is a valid form of immediate inference for all types of propositions.

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9.10 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress I

A.

1. No partisans are umpires. Logically equivalent.
2. Some conductors are metals. Logically equivalent.
3. Conversion not valid.
4. Some animals are dogs (by limitation). Not logically equivalent.
5. Some dogs are animals. Logically equivalent.
6. Some writers are women. Logically equivalent.
7. Some philosophers are scientists (by limitation). Not logically equivalent.
8. Some pets are cats. Logically equivalent.
9. No saints are sinners. Logically equivalent.
10. No professionals are non-artisans. Logically equivalent.

B.

1. All circles are non-polygon. Logically equivalent.

2. All radicals are non-students. Logically equivalent.

3. Some officers are not non-soldiers. Logically equivalent.

4. All scholarship holders are non-students. Logically equivalent.

5. No non-students are brave. Logically equivalent.

6. No red things are non-roses. Logically equivalent.

7. All roses are red things. Logically equivalent.

8. Some students are brave. Logically equivalent.

9. All giraffes are non short-necked animals. Logically equivalent.

10. All men are non-angels. Logically equivalent.

C.

(A, B and C are the steps involved in the contraposition)

1. A. Some brave persons are non-students (by obversion)
B. Some non-students are brave persons (by conversion)
C. Some non-students are not non-brave persons (by obversion) Logically equivalent

2. A. All mortals are non-men. (by obversion)
B. Some non-men are mortals (conversion by limitation).
C. Some non-men are not non-mortals. (Contraposition by limitation) Not logically equivalent

3. A. No cats are non-mammals. (by obversion)
B. No non-mammals are cats. (by conversion)
C. All non-mammals are non-cats.(by obversion) Logically equivalent

4. A. Some poets are non-idealists. (by obversion)

B. Some non-idealists are poets. (by conversion)

C. Some non-idealists are not non-poets (by obversion) Logically equivalent

5. A. No saints are non-polite. (by obversion)

B. No non-polite are saints. (by conversion)

C. All non-polite people are non-saints. (by obversion) Logically equivalent

6. A. Some professors are non-good orators.(by obversion)

B. Some non-good orators are professors. (by conversion)

C. Some non-orators are not non- professors. (by obversion) Logically equivalent.

7. A. No dogs are non-intelligent beings. (by obversion)

B. No non-intelligent beings are dogs. (by conversion)

C. All non-intelligent beings are non-dogs. (by obversion) Logically equivalent.

8. A. No cats are non-mammals. (by obversion)

B. No non-mammals are cats. (by conversion)

C. All non-mammals are non-cats.(by obversion) Logically equivalent.

9. Not valid. Not logically equivalent.

10. A. All saints are non-martyrs. (by obversion)

B. Some non-martyrs are saints. (conversion by limitation)

C. Some non-martyrs are not non-saints. (by obversion) Not logically equivalent.

D.

1. Solution: Given that "All saints are pessimists" is true:

Then "No saints are non-pessimists"--- True, by obversion

2. Solution: Given that “All saints are pessimists” is true:

Then “Some saints are not pessimists” is false by contradiction

3. Solution: Given that “All saints are pessimists” is true

Step 1: “All non-pessimists are non-saints” True by contraposition

Step 2: Some non-saints are non-pessimists True by (conversion by limitation)

Step 3: Then “All non-saints are non-pessimists” is undetermined because from the truth of I nothing can be said about the truth value of corresponding superaltern A proposition.

4. Solution: Given that “All saints are pessimists” is true:

Step 1: “No saints are non-pessimists” --- True, by obversion

Step 2: “No non-pessimists are saints” ---True, by conversion

Step 3: Then “Some non-pessimists are saints” must be false by contraposition.

5. Solution: Given that “All saints are pessimists” is true:

Step 1: “All non-pessimists are non-saints”--- True, by contraposition

Step 2: Then “No non-pessimists are non-saints” must be false by contrary relation.

F.

1. Solution: Given that “No pirates are merchants” is true:

Then “All pirates are merchants” is false by contrary.

2. Solution: Given that “No pirates are merchants” is true:

Step 1: Some non-merchants are not non-pirates--- True, contraposition by limitation.

Then “Some non-merchants are non-pirates” is undetermined

3. Solution: Given that “No pirates are merchants” is true:

Step 1: No merchants are pirates--- True, conversion by limitation.

Step 2: Some non-pirates are not non-merchants--- True by contraposition by limitation.

Step 3: Then “Some non-pirates are non-merchants” is undetermined by relation of sub-contrary.

4. Solution: Given that “No pirates are merchants” is true:

Step 1: All pirates are non-merchants--- True, by obversion

Step 2: Then “Some non-merchants are pirates” is true, by (conversion by limitation)

5. Solution: Given that “No pirates are merchants” is true:

Step 1: No merchants are pirates--- True, by conversion by limitation

Then “All merchants are pirates” is false by contrary.

G.

1. Solution: Given that “Some dogs are pets” is true:

Then Some pets are dogs is true, by conversion by limitation

2. Solution: Given that “Some dogs are pets” is true:

Step 1: Some dogs are not non-pets--- True, by obversion

Step 2: The converse of target proposition is, “Some dogs are non-pets”

Since O is true I is undetermined.

3. Solution: Given that “Some dogs are pets” is true:

Step 1: Some pets are dogs--- True, by conversion (by limitation)

Step 2: Some pets are not non-dogs--- True, by obversion

Since the subject and predicate terms in the proposition obtained from step 2 are not same as the target proposition i.e. “No non-dogs are pets” the value is undetermined.

4. Solution: Given that “Some dogs are pets” is true:

Step 1: Some dogs are not non-pets--- True, by obversion

Then “All dogs are non-pets” is false by contradiction.

5. Solution: Given that “Some dogs are pets” is true:

Then “Some dogs are not non-pets” is true by obversion.

H.

1. Solution: Given “Some animals are not cats” is true:

Then “No animals are cats” is undetermined because from the truth of O proposition nothing can be said with certainly about the truth value of corresponding superaltern E proposition.

2. Solution: Given “Some animals are not cats” is true:

Step 1: Some animals are non-cats--- True, by obversion

Then “No animals are non-cats” is false by contradiction.

3. Solution: Given “Some animals are not cats” is true:

Step 1: Some non-cats are not non-animals---True, by contraposition by limitation

Then “All non-cats are non-animals” is false by contradiction.

4. Solution: Given “Some animals are not cats” is true:

Step 1: Some animals are non-cats---True , by obversion

Step 2: Some non-cats are animals---True by conversion

5. Solution: Given “Some animals are not cats” is true:

Then “Some animals are non-cats” is true by obversion.

UNIT 6 INTRODUCTION TO FALLACIES*

Structure

10.0 OBJECTIVES

The objectives of this unit are,

- to introduce the kinds of fallacies in logic.
- to understand and elucidate various informal fallacies with suitable examples.
- To enable learner how to avoid these fallacies.

10.1 INTRODUCTION

One of the major 19th Century Mathematician and Logician, Gottlob Frege, rightly pointed out that the primary tasks of a logician are to distinguish incorrect reasoning from correct reasoning and to "indicate the *pitfalls* laid by language in the way of the thinker." When the premises of an argument are unable to support its conclusion, such an argument is considered to be fallacious. For example, 'This man is not intelligent because he cannot run fast', exhibits fallacious reasoning. Thus, a *fallacy* can be understood as any kind of error or mistake in reasoning. As it must have already been discussed in the previous units, every argument in logic is governed by some axioms and when these axioms are violated, a fallacy occurs and the argument becomes invalid. In logic, a fallacy in fact signifies some typical mistakes in reasoning which can be

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recognized and named. Many arguments may serve as an example of a particular type of mistake in reasoning or a particular kind of fallacy. Let us consider an example, if from the fact that 'All whales are mammals' and 'X is a mammal'; we conclude: 'X is a whale'; the argument becomes fallacious. All whales are mammals, but not every mammal is a whale. The argument discussed in the example above is fallacious because the conclusion does not correctly follow from the premises. There is an error in reasoning in the given argument which may recur in different contexts. The kind of error here is in the *form* of argument and hence it is a kind of formal fallacy. Formal fallacies have been discussed in the unit dealing with categorical syllogisms. In this unit, we will focus on the more commonly occurring fallacies viz., informal fallacies. Informal fallacies arise due to mistakes in our everyday use of language. Thus, they pertain to the *content* of the argument. The language we use in speaking and writing can sometimes be imprecise, obscure and ambiguous - we need to know how to recognize these mistakes. This will help us to refrain from using fallacious arguments. There may be various sources of fallacies in our daily life such as: a lack of complete knowledge about the context, making false assumptions, misinterpretations, lack of attentiveness, a tendency to make generalized conclusions without considering sufficient number of cases, distractions of the mind, having some preconceived notions and prejudices, being swayed away by emotions, so on and so forth. We must use logic to identify such errors in reasoning and follow appropriate methods to tackle them. Further, we must also be fair in our examination and provide space for the use of natural language in everyday life. For example: the use of figures of speech like sarcasm, metaphor, irony etc. by writers in order to convey a particular meaning – in such cases we must be cautious as although the used argument may appear to be fallacious superficially but it may not actually be so.

10.2 KINDS OF FALLACIES

There are two major types of fallacies.

a) Formal Fallacies
b) Informal Fallacies

10.2.1 Formal Fallacies

A formal fallacy arises when there is a fault in the form of a given argument. When a syllogism fails to adhere to any of the rules required for it to be a valid categorical syllogism then the fallacy occurred is formal. Some types of formal fallacies are as follows: Fallacy of Undistributed Middle, Fallacy of Illicit Major, Fallacy of Illicit Minor, Existential Fallacy, etc. As Formal fallacies have been discussed in detail with categorical syllogisms, let us go on to look at informal fallacies.

10.2.2 Informal Fallacies

There are various informal fallacies. Following I.M. Copi, they can be grouped under four major categories, viz., Fallacies of Ambiguity, Fallacies of Relevance, Fallacies of Defective Induction and Fallacies of Presumption. The following is the categorization within the four kinds of informal fallacies.

1) Fallacies of Ambiguity
    i) Fallacy of Equivocation
    ii) Fallacy of Amphiboly
    iii) Fallacy of Accent
    iv) Fallacy of Composition
    v) Fallacy of Division
2) Fallacies of Relevance
    i) The Appeal to Emotion (Argument *ad populum*)
    ii) The Red Herring
    iii) The Straw Man
    iv) The Argument Against the Person (Argument *ad hominem*)
        (a) Abusive
        (b) Circumstantial
    v) The Appeal to Force (Argument *ad baculum*)
    vi) Missing the Point or Irrelevant Conclusion (*Ignoratio elenchi*)
3) Fallacies of Defective Induction
    i) The Argument From Ignorance (Argument *ad ignorantiam*)
    ii) The Appeal to Inappropriate Authority (Argument *ad verecundium*)

iii) False Cause (Argument *non causa pro causa*)

iv) Hasty Generalization (Fallacy of *Converse Accident*)

4) Fallacies of Presumption

i) Fallacy of Accident

ii) Begging the Question (*petitio principii*)

iii) Complex Question

Let us discuss each of these fallacies and their sub-types along with illustrations.

10.3 KINDS OF INFORMAL FALLACIES

10.3.1 Fallacies of Ambiguity

The erroneous reasoning in this kind of informal fallacy occurs due to the equivocal use of words or phrases. In such cases, some term or phrase has a different meaning in one part of the argument than the same term or phrase in another part of the argument. When language is used in an inattentive and loose manner, such errors arise. It may be due to incorrect use of words or due to incorrect construction of statements. The five sub-types within Fallacies of Ambiguity are as follows:

10.3.1.1 Fallacy of Equivocation

The Fallacy of Equivocation arises when the same term or a phrase is used in a manner such that it has two different meanings in the same argument.

Let us consider the following examples:

- "I will abide by Gopal's suggestion because he gives sound suggestions'. Another person says. "Yes, his sound is audible even from a far distance". Thus, I can hear his suggestion even from a far distance. In this case, the term 'sound' has two different meanings. Firstly it means that which is based on valid reason or good judgment; reliable: he gives reliable suggestions. Secondly, the word 'sound' means the noise or vibrations produced while talking.

- John is a big writer because he is from a big city. Here, the term 'big' is a relative term. The meanings of relative terms differ in degrees from context to context. Thus, they cannot have the same meaning at different occurrences.

10.3.1.2 Fallacy of Amphiboly

The Fallacy of Amphiboly arises when the construction of the statement is such that it has more than one possible meaning.

As also pointed out in the examples above, in the cases of Fallacy of Equivocation the ambiguity lies in the *meaning* of a word or a phrase. Fallacy of Amphiboly refers to the ambiguity of a statement due to its grammatical *structure*.

Let us consider the following examples:

- "Kids make delicious dinners."
  One meaning of the given statement can be that children prepare (cook) delicious meals. Another meaning of the statement can be that kids are delicious food item for dinner. Even though, the latter sounds ridiculous.
- "Mary ran to meet his 6 year old son, cheerful and happy."
  One meaning of the above statement can be that Mary is cheerful and happy. The other meaning of the statement can be that her son is cheerful and happy.
- "Save water and waste paper."
  The above statement can have two meanings. First, that one should save water but one can waste paper. Second, it can mean that one should save both 'water' as well as 'waste papers'.
- Let us look at an example from the domain of mathematics. Suppose we are instructed that find a number 'x' that is equal to two times seven plus eight. The statement commits the fallacy of amphiboly, since the answer can be either:
  [(2*7) +8 = 22] or
  [2*(7+8) = 30]
  The above example shows us the importance of the use of correct punctuation marks in language, including the field of mathematics.

10.3.1.3 Fallacy of Accent

The Fallacy of accent arises when the meaning of a statement is changed or distorted by wrongfully stressing on or emphasizing some particular part (words) of it.

It is important to note that, the Fallacy of Accent, similar to the previously discussed, Fallacy of Amphiboly, is not an inferential fallacy. In our use of language, we do often emphasize a particular word or phrase to put forth a particular point. When, a word or a phrase, which was not emphasized in the original text by an author, is incorrectly emphasized upon later by someone else, the meaning of the statement changes. The elements such as accent, stress, tone etc., tend to change the meaning of the statements, often quite drastically. This in turn makes the argument fallacious.

Let us consider the following example:

- "Wife without her husband is nothing."

  The above statement would convey different meanings to husband and wife depending upon the emphasis on the term 'wife' or the term 'husband'. If the emphasis is on 'wife' then the meaning of the statement will be: For a wife, husband is important as she will be nothing without him. If the emphasis is on the term 'husband' then the meaning will be that for husband, wife is important as without her he will be nothing.

10.3.1.4 Fallacy of Composition

The Fallacy of Composition arises when the conclusion is drawn from the properties of the parts of a whole to the properties of whole itself. In this case, it is assumed that what is applicable to the parts is applicable to the whole as well. The fallacy occurs because the whole, the comprehensive set is regarded as the collection of its subsets.

Let us consider the following examples:

- Each and every player of the Indian Hockey team is an excellent player. Thus, the Indian Hockey team is an excellent team.

The given argument is fallacious because for a team to be excellent it is not just sufficient that it has players who are talented and skilled. What is also required for the proper and smooth functioning of a team are the key values of unity and team spirit.

- There can be another form of this fallacy in which one argues from a premise containing a term taken distributively to a conclusion in which the term is used collectively. For example, “An elephant eats more food than any other animal does. Therefore, elephants of Sanjay Gandhi National Park eat more food than all the other animals in the park.

The above example involves incorrect reasoning because even though an elephant in comparison with other animals may eat more food, yet collectively all the other animals, being greater in number, eat more food than all the elephants in the Park.

10.3.1.5 Fallacy of Division

The Fallacy of Division arises when the properties of its parts are drawn from the properties of whole. The Fallacies of Division and Composition are reciprocal fallacies. In case of Fallacy of Division, what is applicable only to the whole is erroneously predicated to its parts. So, it becomes incorrect to reason that since a particular football team is a good one, so each of its players must be good. Similarly, one may reason wrongly when one says what is good for the nation is also necessarily beneficial for each of its citizens.

Let us look at the following examples:

- Indians are fond of the game of Cricket.

  Ram is an Indian.

  Therefore, he is fond of the game of Cricket.

- No men desire the success of all.

  So, no man desires his own success.

  The above examples illustrate the Fallacy of Division,

It has become evident from our discussion so far that the fallacies of ambiguity occur due to a lack of knowledge, wrong interpretation and incorrect understanding.

Check Your Progress I

Note: a) Use the space provided for your answer.

b) Check your answers with those provided at the end of the unit.

1. When the fallacy of equivocation arises?

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2. When the fallacy of composition arises?

10.3.2 Fallacies of Relevance

Fallacies of Relevance arise when the premises of an argument are irrelevant to the conclusion for some reason. The premises may appear to be relevant to the conclusion initially, but on close analysis and examination, they are found to be inadequate. In this case, the premises of the argument may appear to be psychologically relevant but for a sound argument, the premises must be logically relevant rather than psychologically. There are mainly six sub-categories within this fallacy. They are as follows:

10.3.2.1 The Appeal to Emotion (Argument *ad populum*)

This fallacy arises when an argument is supported with the help of an appeal to emotions and not by reasoning. For example, a political speech may appeal to emotions in order to stir up love or hatred among the masses. Emotionally charged language is often used in order to manipulate the beliefs of the public and gather their approval or disapproval on some issue.

Let us consider the examples given below:

- In William Shakespeare's Julius Caser, when Mark Antony instigates the crowd to take revenge on Caesar's killing, he says, "... You all did love him once, not without cause: What cause withholds you then, to mourn for him? ..."
  It is evident that the phrases and arguments used in the speech appeal to emotions.
- 60 percent of people buy Motorola phones rather than any other brand. All these people cannot be wrong. Thus, Motorola is the best phone brand in the market.

  In this example, the conclusion is drawn and taken to be true on the basis of what many people popularly believe. However, the argument becomes fallacious as the soundness of reasoning should be judged not on the basis of popularity but on the relevance of the premises involved in the argument to the conclusion.

- "If we send this man to jail, who will feed his five little hungry and helpless kids. Therefore, in the interest of the poor children, pardon the man."

  In the above example we see that an appeal of special kind of emotions is being made viz., pity and sympathy. The argument appeals to the heart rather than to the head.

  The employment of emotionally laden and expressive language to support conclusions in arguments is not a logically acceptable approach. Thus, such arguments, which involve an appeal to emotions, are fallacious.

10.3.2.2 The Red Herring

This fallacy arises when a deliberate attempt is made to distract or divert the attention of listener(s) from the original topic, with the intention to do away with the original issue under discussion. According to the ancient story, red herring was used to confuse or divert dogs. So, anything that can mislead and can keep the listener off the track can act as a 'red herring'.

Let us look at the example below:

- Mother (At 8.30 pm): It is time for you to go to bed.

Boy: Mummy, I feel hungry … I also have a stomach ache … I need to go to the bathroom …

In this case, the mother of a young boy tells him to go to bed as it is his bed-time. He in turn begins to talk about other issues such as, he is hungry, or he needs to go to the bathroom. Such statements are made to avoid the central topic of going to bed and to distract the mother. The fallacy committed here is The Red Herring.

10.3.2.3 The Straw Man

The Straw Man Fallacy occurs when one argues against an opponent's view by presenting the opponents position in a manner which can be easily refuted. The opponent's actual view is put forth in a distorted and misinterpreted manner and then refuted. The misconstrued and exaggerated version of the opponent's position which the arguer himself presents and then refutes is in fact like a 'straw man'.

Let us consider the following example:

- Jinsi is the class secretary. She suggests in the class meeting that the class should participate in more social service projects and programs. To this, Ram says that he cannot believe that Jinsi does not support the annual school dance program.

The above case involves erroneous reasoning. What Ram is refuting here is a misinterpreted version of Jinsi's viewpoint. Jinsi's view of encouraging and facilitating social service projects is misconstrued as a necessary disapproval of all the other events and activities of the school. This distorted version of Jinsi's view is attacked by the arguer. It is similar to attacking a straw man.

10.3.2.4 The Argument Against the Person (Argument *ad hominem*)

This fallacy arises in the following way. Person X makes an argument. Person Y evaluates the argument. Person Y shows that the argument made by X is wrong because either:

a) Person X carries a bad reputation and so his argument cannot be sound. (Abusive)

Or

b) Person X's circumstances are questionable hence his argument cannot be sound. (Circumstantial)

In this type of fallacy, the argument is examined not on the basis of its premises but on the basis of the person making the argument, his circumstances etc. Personal emotions, interests, attitudes, prejudices etc., lead to this fallacy.

For example:

- Since he is a leftist, he will not favour the policy even if it beneficial for the people. (Abusive)
- Since he works for Amazon, he will naturally give arguments in favour of e-commerce. We cannot believe him. (Circumstantial)

10.3.2.5 The Appeal to Force (Argument *ad baculum*)

This fallacy arises when an arguer threatens his opponent with some undesirable or unpleasant consequences if his viewpoint is not accepted. This appeal to force doesn't necessarily involve physical force or threat but can also use subtle threats to persuade the other person. In logic, accepting a conclusion merely based on threat is not sound.

For example:

- The auto drivers often threaten the authorities that if their demands are not met, they will go on strike.
- "Give me your wallet or else look at the knife in my hand."

10.3.2.6 Missing the Point or Irrelevant Conclusion (*Ignoratio elenchi*)

This fallacy is committed when instead of proving what is intended, we prove something different. That is to say, the premises imply something other than the conclusion which they are supposed to imply. *Ignoratio elenchi* means "ignoring the conclusion to be proved" and instead "proving the wrong conclusion."

This can be further understood by looking at the example given below.

- The object of war is peace therefore army soldiers are the best peacemakers.

  This argument commits the Fallacy of Irrelevant Conclusion as even if it is assumed that the object of war is peace, still it does not imply that army soldiers are the best peacemakers. Since the premise misses the point, this fallacy is also called "Missing the Point".

Check Your Progress II

Note: a) Use the space provided for your answer.

b) Check your answers with those provided at the end of the unit.

1. What does Fallacy of *straw man* mean?

10.3.3 Fallacies of Defective Induction

In the Fallacies of Defective Induction, the premises of the argument may be relevant to the conclusion but they are too weak to support the conclusion. This will be further clarified when we look at the four sub-types under this fallacy along with an example of each.

10.3.3.1 The Argument From Ignorance (Argument *ad ignorantiam*)

This fallacy arise when it is argued that a proposition is true on the basis that it has not been proved false, or when it is argued that a proposition is false because it has not been proved to be true.

For example:

- There is no evidence that cigarette smoking causes lung cancer. Thus, cigarette smoking does not cause lung cancer.

Here, the appeal is made to ignorance rather than to knowledge. The fact that it has not been definitely proven yet that smoking leads to cancer, it does not imply conversely that smoking does not cause cancer.

10.3.3.2 The Appeal to Inappropriate Authority (Argument *ad verecundium*)

This fallacy arises when the authority who is cited, does not have enough credibility to judge the issue at hand.

Let us consider the following example:

- When some famous Bollywood actor says that a particular brand of tea is good and it is accepted as good; it is fallacious. The actor is not authority to judge the quality of tea. He is an authority in the field of acting and entertainment. Had he recommended a particular acting school, his words would have been reliable. But in the domain of tea, he does not have credibility as he is not an expert.

10.3.3.3 False Cause (Argument *non causa pro causa*)

This fallacy is committed when a non-causal event is assumed to be either a cause or part of a cause of an effect. That is to say, in such cases, a causal relationship is assumed to exist when actually there is none.

For example:

- Harry drinks 'Rasna' with water every day. That is the cause of his good performance in studies.

- When the building got burnt, the sun was shining bright. Thus, the bright shining sun is the cause of the building burning.

The above example shows another form of the Fallacy of False Cause called *Post hoc ergo propter hoc*. It means, 'after the thing, therefore, because of the thing'. Although temporally, a cause is always prior (antecedent) to the effect, yet to say that every antecedent event is necessarily the cause of the following event is fallacious.

10.3.3.4 Hasty Generalization (Fallacy of *Converse Accident*)

The Fallacy of Hasty Generalization arises when it is argued in a careless and quick manner from one or very few instances to a very broad or universal claim. In this fallacy, a general rule is formed on the basis of very few instances.

For example:

- To give charity to healthy beggars is wrong. Thus, charity of all kinds is wrong.

  In this example, even though few cases/instances of fit and healthy beggars stop us from giving them charity. It is erroneous to form a universal claim that all kinds of charity are wrong. There can be people who are poor and needy and genuinely require support.

10.3.4 Fallacies of Presumption

Fallacies of Presumptions are committed when unnecessary presumptions are made prior to making an argument. The premises already presume to be true (without evidence) what they aim to prove. There are three major sub-categories under this:

10.3.4.1 Fallacy of Accident

This fallacy occurs when general or universal claim is erroneously applied to an individual case which is not properly governed by that general claim.

For example:

- In the moral domain, when we look at the universal moral dictum, it is true that lying is a sin but if in order to save lives, one lies, it would not be wrong. So, to presumably say that all acts of lying are wrong, without taking into consideration some special circumstances is fallacious.

10.3.4.2 Begging the Question (*petitio principii*)

This fallacy arises when the conclusion or some part of the conclusion is already stated in the premises either explicitly or in some slightly different form. This fallacy of *Petitio Principii* is also called 'reasoning in a circle' because the conclusion is already present in the evidence, out of one's eagerness to prove it. The reasoning involved becomes superfluous as the conclusion is already assumed.

For example:

- Ram is a good student because he spends more time studying. He spends more time studying because he is a good student.

  This argument involves 'reasoning in circle'.

10.3.4.3 Complex Question

This fallacy arises when a question is asked in such a way that it assumes or presupposes the truth of some facts hidden in it (question). In this fallacy, often a single question is asked but two or three questions are wrapped up in it. Thus, it is also called 'Fallacy of Many Questions'.

Let us consider the example given below,

- "Have you stopped being careless with your work?"

  In this case, there are two question involved. First, 'Did you ever have a tendency of being careless towards your work?" and second, "Have you given up that attitude now?". Further, an affirmative answer to the question asked in the example presumes that earlier the person had a careless attitude towards his work.

An adequate knowledge about all the various informal fallacies, as discussed above, helps us to avoid mistakes in reasoning and enables us to always use correct reasoning while framing arguments.

Check Your Progress III

Note: a) Use the space provided for your answer.

b) Check your answers with those provided at the end of the unit.

1. Check the fallacy in the following statements:

   i. Haldiram's is a famous restaurant because they serve delicious food. Haldiram's serves delicious food because it is a famous restaurant.

ii. "Have you stopped drinking alcohol?"

iii. IIT Bombay is the best institute in the country; therefore every student of IIT Bombay must be the best student in the country.

iv. Since Sachin Tendulkar promotes Toshiba TV, therefore Toshiba TV must be good.

10.4 LET US SUM UP

In this unit we have discussed informal fallacies, the four main kinds of informal fallacies, viz., Fallacies of Ambiguity, Fallacies of Relevance, Fallacies of Defective Induction and Fallacies of Presumption. In this unit we have also covered the sub-categories within each of these four broad categories of informal fallacies along with adequate examples. The wider scope of the unit consists in looking at the kinds of errors and mistakes the human mind is prone to make when we use arguments in our day to day life. The illustrations provided from our everyday use of natural language helps to facilitate better understanding. The informal fallacies involve those fallacies which may occur when we use language incorrectly in making arguments.

10.5 KEY WORDS

Fallacy: an error in reasoning.

Formal Fallacy: fallacies that occur in the 'form' of an argument.

Informal Fallacy: fallacies that occur in the 'content' of an argument.

10.6 FURTHER READINGS AND REFERENCES

- Read, Carveth. *Logic: Deductive and Inductive*. Dodo Press, 1914.
- Copi, I.M. *Introduction to Logic*. New Delhi: Prentice Hall India, 9th Ed., 1995.

10.7 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress I

1. The Fallacy of Equivocation arises when the same term or a phrase is used in a manner such that it has two different meanings in the same argument.

2. The Fallacy of Composition arises when the conclusion is drawn from the properties of the parts of a whole to the properties of whole itself.

Check Your Progress II

1. The Straw Man Fallacy occurs when one argues against an opponent's view by presenting the opponents position in a manner which can be easily refuted. The opponent's actual view is put forth in a distorted and misinterpreted manner and then refuted. The misconstrued and exaggerated version of the opponent's position which the arguer himself presents and then refutes is in fact like a 'straw man'.

Check Your Progress III

i. Fallacy of *Petitio Principii*
ii. Fallacy of Complex Question
iii. Fallacy of Division
iv. Fallacy of Appeal to Inappropriate Authority