Chapter Four

4.1. Proposition

4.1.1.Categorical proposition

- **Category:** a group, collection, or class of similar things.
- **Proposition:** refers to statement. A declarative sentence that can be evaluated as either true or false.
- **Categorical proposition:** a simple statement that expresses relation of two classes, asserting that one class is either totally or partially included or excluded from another class.
- Any categorical proposition has two terms: subject term and predicate term.

4.1. Components and Standard Forms of Categorical Proposition

A. Components

- Every CP, if it is stated in standard from, has exactly four distinct components. These are:

- **Quantifier**: “All”, “No” or “Some”. Note that “some” in logic refers to at least one.
- **Subject term**: term which is stated by referring to other class term (predicate).
- **Copula**: term that connects subject and predicate term.
- **Predicate term**: term that serve as a reference for the subject term.

Example:

1. All human beings are mortal.

2. Some birds are mammals.

- For the 1st example; Quantifier = All, subject term = human beings, Copula = are; Predicate term = mortal
- For the 2nd example: Quantifier =some; Subject term = birds; Copula = are; and Predicate Term = mammals

Correct order of categorical proposition

Quantifier → subject term → copula → predicate term

B. Standard Forms

- Forms are designed based on the rules of the partial or whole inclusion or exclusion.

  1. The whole ST is included in the PT.
  2. The whole ST is excluded from PT.
  3. Partially, the ST is included in the PT.
  4. Partially, ST is excluded from the PT.

The above forms have the following symbolic representations.

- All S are P ⟶ all members of S are in P.
- No S are p ⟶ No members of S are in P.
- Some S are p. ⟶ at least one member of S is in P class
- Some S are not p. ⟶ at least one member of S is not in P class.

Note:

- The form 'All S are not P' is *not a* standard form. This form is ambiguous and can be rendered as either "No *S* are *P*" or "Some *S* are not *P*," depending on the content.

- There are exactly three forms of quantifiers and two forms of copulas i.e "are" and "are not."

- Other texts allow the various forms of the verb "to be" (such as "is," "is not," "will," and "will not") to serve as the copula.
- For the sake of uniformity, we are restricted on the above two copula.

4.2 Quality, quantity and distribution

- Quality and quantity are attributes of categorical propositions.
- In order to see how these attributes pertain, it is useful to rephrase the meaning of categorical propositions in class terminology:

A. Quality:

- The **quality** of a categorical proposition is either affirmative or negative depending on whether it affirms or denies class membership.

i. Affirmative = ST is partially or entirely included in the PT

ii. Negative = ST is partially or entirely excluded from the PT.

- **Example:** ‘‘All *S* are *P* ’’ and

‘‘Some *S* are *P* ’’ have **affirmative** quality, and ‘‘No *S* are *P* ’’ and

‘‘Some *S* are not *P* ’’ have **negative** quality.

B. Quantity:

- Can be either universal or particular.

  I. Universal: full inclusion or exclusion of ST from the PT

  II. Particular: partial inclusion or exclusion of ST from the PT

Example:

- ‘‘All *S* are *P* ’’ and ‘‘No *S* are *P* ’’ each assert something about every member of the *S* class and thus are **universal.**
- ‘‘Some *S* are *P* ’’ and ‘‘Some *S* are not *P* ’’ assert something about one or more members of the *S* class and hence are **particular.**

- But categorical propositions have no "qualifier."
- In universal propositions, the quality is determined by the quantifier, and in particular propositions it is determined by the copula.

N.B: There are four letters that represent the four forms of categorical proposition: A, E, I & O.

- The universal affirmative is called an **A** proposition, the universal negative an **E** proposition, the particular affirmative an **I** proposition, and the particular negative an **O** proposition.

C. Distribution: it is an attribute of terms (subject and predicate) unlike quality and quantity which are attributes of proposition.

- A term is said to be distributed if it is stated without ambiguity (when it asserts all of its members).

- A term is said to be undistributed if it doesn't state the class of things in it.

Standard from	**Letter name**	**Quantity**	**Quality**	**Distribution**	
				Term distributed	**Term Undistributed**
All S are P	A	Universal	Affirmative	**S**	P
No S are P	E	Universal	Negative	S & P	--------
Some S are P	I	Particular	Affirmative	------	S & P
Some S are’t P	O	Particular	Negative	P	S

4.3 Interpretation of categorical propositions

- Two types of interpretations: Aristotelian and Boolean.
- These two interpretations vary only in connection with universal categorical propositions.

- All S are P - All members of S are included in P, and asserts that all members of S actually exist. (Aristotelian Interpretation)
- No S are P - no members of S are included in P, and members of S are actually exist. (Aristotelian interpretation)
- However, Boole is neutral about existence. He stated universal categorical propositions like Aristotle but for Boole it is not assumed that members of *S* actually exist.

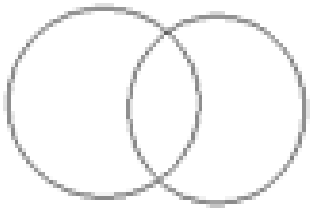
- However, the two interpretations are the same/ compatible with regard to particular propositions.
- Since, therefore Boolean is neutral about existence, it is simple than Aristotelian. So our focus is on Boolean interpretation.

Boolean Interpretation:

- All S are P = No members of S are outside p
- No S are P = No members of S are inside P
- Some S are P = at least one S exists and that S is p
- Some S are not P = at least one S exists and that S is not P

4.3.1 Venn Diagram and Square of Opposition

- **Venn diagram:** it is arrangement of overlapping circles in which each circle represents the class denoted by a term in a categorical proposition.
- Since a categorical proposition has two terms, Venn diagram has two overlapping circles. Conventionally, the first circle represents the ST and the second circle represents the PT.

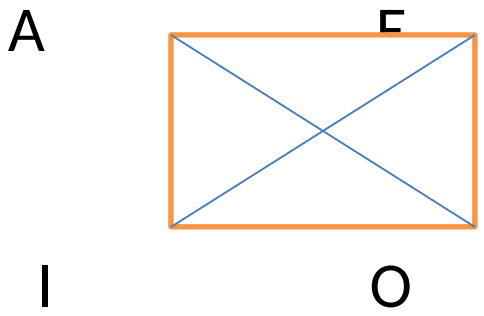


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- We use two marks: shading (refers to empty) and marking (refers to something.)
- Shading is for universals and marking is for particulars.

4.3.3.1 Modern Square of Opposition (MSO)

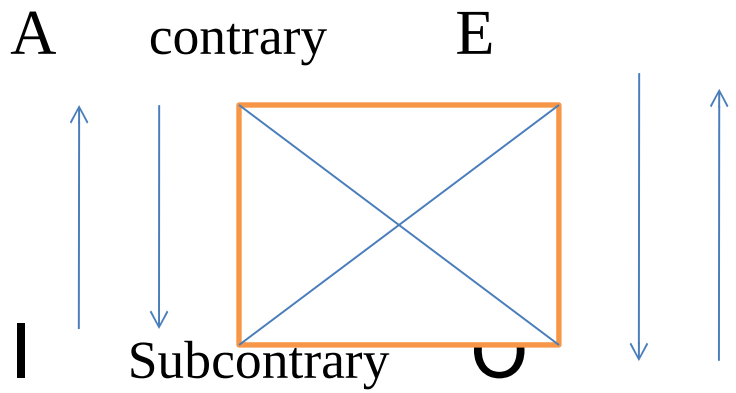
- From the above Venn-diagrams, A & O are contradictory and also E & I.
- MSO is a diagram that shows the relationship of contradictory propositions.



- **Immediate Inference**: proposition having one premise and conclusion is drawn from this single premise.
  - From the MSO, if we know the truth value of "A" is true, "O" is false and vice versa.
  - If "E" is true, "I" is false and vice versa
  - **Venn diagram** is used to test immediate inference as valid or invalid.
  - **Valid**: if information expressed by the conclusion is presented in the premise. If not, **invalid.**

4.3.1.2 Traditional Square of Opposition

- Depends on Aristotelian Interpretation.
- Has four square of oppositions:
  - Contradictory
  - contrary
  - Sub-contrary
  - Sub-alternation



A. Contradictory:

- The same as we discussed under section of Modern Square of Opposition.

B. Contrary:

- Top linear square between A & E.
- Both have the same quantity but different quality.
- So, it is partial opposition.
- Both can be false at the same times but not true.
- Either of the two should be false if no fallacy of illicit contrary will be committed.

So, if A true, E is false.

If E true, A False

Valid.

But

If A is false, E is undetermined

If E is fasle, E is undermined**.**

Invalid--------- illicit contrary

C. Sub-contrary

- Partial relationship
- Bottom linear relationship between T & O
- Different in quality but the same in quantity.
- **Both can’t be false simultaneously.**

- If I is false_ O is true
- If O is false_ I is true

valid/ no fallacy

- If I is true _O is undetermined
- If O is true _ I is undetermined

invalid/fallacious----- illicit sub-contrary

D. Sub-alternation

- Vertical relationship.
- Same in quality but differ in quantity.
- Represented by two arrows. The truth down arrow and the false up arrow.
- The dawn ward arrow transmits only true and the up-ward arrow only false.
- **So:**

  If A is true _I is true **valid**

  If E is true_ O is true

  If I is true _ A is false **valid**

  If O is false _ E is false Illicit Su alternation

  If A is false _ I is undetermined **invalid**

  If E is false _O is undetermined

  If I is true _ A is undetermined **invalid**

  If O is true _E is undetermined

- Note that whenever contrary, sub-contrary, and sub-alteration are used on propositions about things that do not actually exist, we commit **existential fallacy**.

4.4 Conversion, obversion and contraposition

A. Conversion

- Simplest of the three.
- Interchanging the place of S & P.

- Accordingly, by conversion the four propositions look like the following.

Letter Name	Given Proposition	New Statement by Conversion
A	All S are P	All P are S
E	No S are P	No P are S
I	Some S are P	Some P are S
O	Some S are not P	Some P are not S

- E & I are identical in conversion.
- A & O are illicit conversion.

Example:

Some men are people. -------- Some people are men. (T)

No men are eternal------ no eternal are men. (T)

B. Obversion

- 1st change the quality
- 2nd replacing the predicate with its complement.
- Note that complement refers to a group of anything outside that class.

  Example . complement of "chairs" is "non -chairs"

Accordingly, when we apply obversion the four propositions look like the following. Study the following tabular demonstration:

Letter Name	Given Proposition	New Statement by Obversion
A	All S are P	No S are non-P
E	No S are P	All S are non -P
I	Some S are P	Some S are not non-P
O	Some S are not P	Some S are non-P

- All categorical proposition forms have the same truth value in obversion.
- So, no illicit obversion.

C. Contraposition

  - 1st replacing the ST with the complement of the PT.
  - 2nd replacing the PT with the complement of the ST.

- Study the following table:

Letter Name	**Give Proposition**	**New Statement by Contraposition**
A	All S are P	All non-P are non-S
E	No S are P	No non-P are non-S
I	Some S are P	Some non-P are non-S
O	Some S are not P	Some non-P are not non-S

- From this we can see that A & O have identical Venn diagram with their contrapositions.

- E & I are neither opposite nor identical. So, they are illicit in contraposition.