

World Logic Day Writeshop

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WRITESHOP

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FALLACY OF THE SQUARE OF OPPOSITION
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NOEL S. PARIÑAS

ABSTRACT

The heart of Aristotelian Logic is the square of opposition. This study engaged on further [re]investigation and meta-logical analysis of the validity of the square of opposition. Further, in this paper, it has been modestly established, with greater clarity, the exposition of the strengths, more than the presentation of the defects, loopholes and weaknesses, of the Aristotelian Logic in a descriptive and speculative manner. The unconcealment of the breakdown of the square of opposition marked a rupture and the opening of avenues of alternative reasoning. The critical and analytical exposition of the loopholes of the square of opposition led to a realization that things around us could have been and still be different; and there could have been better alternative reasoning than what we have called, adopted, and worshipped [Greek] logic. Results show that the downfall of the oppositional relationships in the square of opposition provided a proof of the logical illusion of Aristotle or the loophole of Traditional Logic. The laws of opposition, that have been considered the measures of logically deductive inferences, are practically almost totally logical deceptions. By implication, if the laws of subcontrariety, contrariety, and subalternation [and may be contradiction] have collapsed, the square of opposition has also collapsed; hence, Aristotle's square of opposition is a fallacy.¹ This means that the square of opposition has errors and in itself an error.

PRELIMINARY CONSIDERATIONS

Traditional Logic, otherwise known as the logic of classes, the logic of terms or syllogistic logic, is the Aristotelian Logic. It could have been assumed that Aristotle, as the father of logic, has already said the last words in logic and has conclusively marked the final punctuation in logic or, at least, in deductive logic, but the emergence of Modern Logic proved that Aristotle has just formally started it. Though nobody could just deny the fact that Aristotle, being one of the most prolific and influential philosophers and logicians in ancient period, has contributed too much in logic

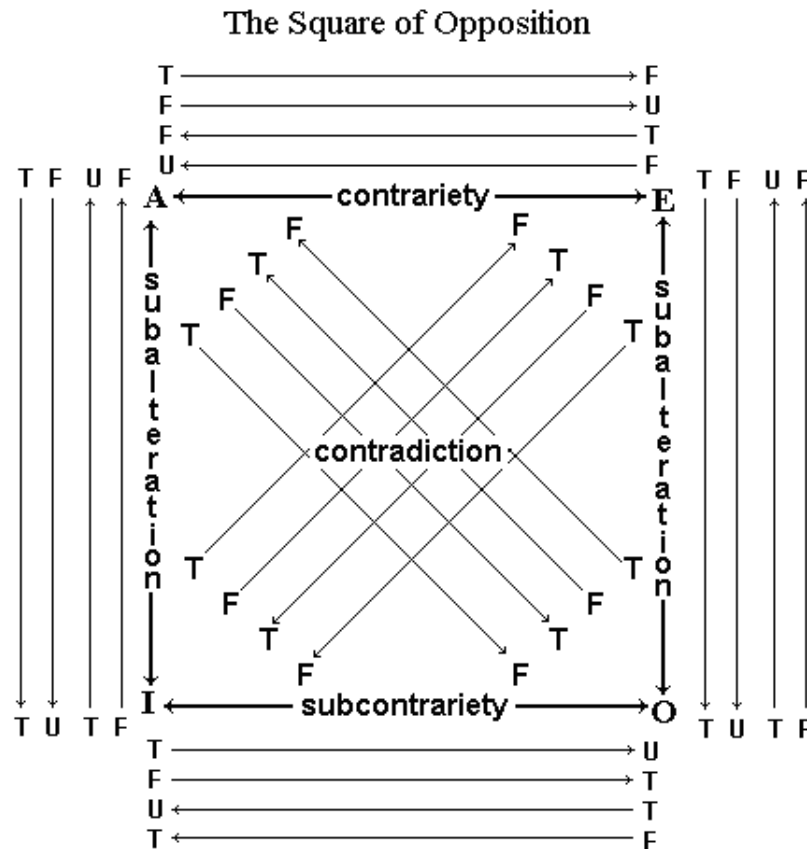
specifically in his works *Organon* and *Natural Philosophy*, the dynamism and contingency of views, theories and traditions still take significant roles not just in the epistemological level but in the level of human existence *per se*.

THE SQUARE OF OPPOSITION AS THE FOUNDATION THE METHODS OF VALIDITY

The square of opposition discusses the relationships of propositions namely: [1] Contrariety,² [2] Subcontrariety,³ [3] Subalternation,⁴ and [4] Contradiction.⁵ It also prophesizes the 'laws of opposition' that are strictly announced by each oppositional relationship which are as follows: [1] The Law of Contrariety which states that contraries can be both false at the same time but not both true; [2] The Law of Subcontrariety which states that subcontraries can be both true at the same time but not both false; [3] The Laws of Subalternation which state that the truth of the subalternan implies the truth of the subalternate but not vice versa and the falsity of the subalternate implies the falsity of the subalternan but not vice versa; and [4] The Law of Contradiction which states that contradictories can neither be both true at the same time nor both false simultaneously.⁶

The breakdown of the square of opposition happens when these laws of opposition is [re]viewed in the light of Modern Logic with the aid of Gottlob Frege's Quantification Logic specifically since Quantification Logic, as the logic of predicate, seeks to interpret syllogistic logic within the framework of sentential logic. Hereunder is the diagram of the square of opposition:

Fallacy of the Square of Opposition



Quantification Logic, inasmuch as universal propositions are statements that are non-committal to existence, accurately and sensibly treats these statements as hypothetically conditional statements rather than categorical. Only existential statements are treated as conjunctive statements since only these statements are existence-oriented so that the four standard-type categorical statements when symbolically quantified are as follows:

Proposition		Standard Expression		Quantified Expression
A	↔	All subjects are predicates.	↔	$(\forall x)(Sx \rightarrow Px)$
E	↔	All subjects are not predicates.	↔	$(\forall x)(Sx \rightarrow \neg Px)$
I	↔	Some subjects are predicates.	↔	$(\exists x)(Sx \& Px)$
O	↔	Some subjects are not predicates.	↔	$(\exists x)(Sx \& \neg Px)$

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Quantity Quality		Quantified Interpretation
Universal	Affirmative	(If x is a subject, then x is a predicate.)
Universal	Negative	(If x is a subject, then x is not a predicate.)
Existential	Affirmative	(Such that x is a subject and x is a predicate.)
Existential	Negative	(Such that x is a subject and x is a not predicate.)

The nature of this analysis by quantification logic is anchored on the notions of 'existential import' and on the concept of the 'null class' as espoused by Modern Logic.

When a statement is claimed to have existential import, it means that it asserts the existence of the objects denoted by its terms. In other words, a statement is 'existential' if it asserts the existence of things it speaks about, and by existence it means actual existence, not just possible or hypothetical.

Conformably, when Modern Logic attributes existential import to particular statements, I and O, it is its claim and assertion that these statements refer to actual existence of things. For instance, the particular statement 'Some Filipinos are Asians' affirms that there exists at least one Filipino and this Filipino is Asian.

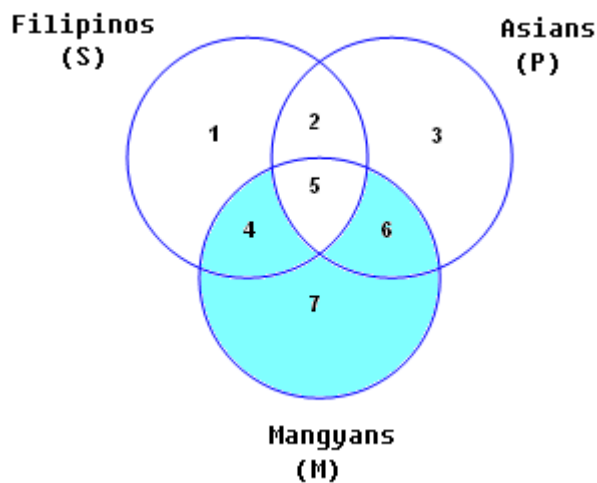
On the other hand, according to Modern Logic, where statements signify 'classes,' a class is to be construed as having or not members. In other words, a class may be 'null' or 'empty,' meaning, a group of things that does not exist, whose existence cannot be known or whose existence is purely hypothetically conditional. Examples would be the class of non-mammalian whales, of immortal humans, of square-circles, of gremlins, of mulawins and Spiderman. It must be noted in contrast that the Aristotelian Logic considers a 'class' as always having members. It speaks from the point of view of common sense and considers a class as having members, if the class is to be sensibly spoken as a class at all.

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John Venn for example whose diagrammatic interpretations of the Aristotelian propositions illustrates implicitly his disagreements with Aristotle that even universal statement is existence-oriented. There are, in fact, arguments that are considered valid under the Aristotelian measures of validity but when [re]viewed within the framework of the Venn Diagrams become invalid. The syllogism below is an example:

Syllogism ⁷	Mood ⁸	Figure ⁹
All Mangyans are Asians; All Mangyans are Filipinos; Therefore, some Filipinos are Asians.	AAI	3

Venn Diagram Method



If the syllogistic form¹⁰ is valid, there should be an 'X' mark that appears somewhere in areas 2 or 5 of the overlapping of circles when the premises are diagrammed. Since the conclusion, represented by an 'X' mark in the above syllogism cannot be read off from the overlapping circles, it is precisely obvious that the conclusion 'Some Filipinos are Asians' is not self-evident in the diagram, so that although the syllogistic form seems to appear valid and true because it does not violate any of the Aristotelian rules, and therefore, it does not commit any Syllogistic Formal

Fallacy of the Square of Opposition

Fallacy, [Fallacy of Undistributed Middle,¹¹ Fallacy of Illicit Major/Minor,¹² Fallacy of Exclusive Premises,¹³ and Fallacy of Illicit Negative,¹⁴] it is not an exemption to John Venn.

Venn diagrams are actually Boolean interpretations of the Aristotelian propositions so that even George Boole, in his equations, illustrates the nullity of the universal propositions.¹⁵ If universal statements, therefore, are neutral or non-committal to existence and existential statements are existence-oriented, it would be logically erroneous to draw an existential conclusion from universal premises. Drawing actuality from possibility pierces the heart of deductive reasoning which postulates that the conclusion of an argument is necessarily lesser than or equal to the premises but not greater or stronger than (*De posse ad esse no vallet illation*). Modern logic calls this error 'Fallacy of Illicit Existence.'¹⁶ Consequently, fallacy of illicit existence results to the invalidity of the four syllogistic forms [Darapti, Felapton, Fesapo and Bramantip] proven valid by Aristotelian logic.¹⁷ With this, from the 256 syllogistic forms, not anymore 19 but only 15 are accepted valid nowadays.¹⁸

Aside from the Venn Diagram Method, even the Antilogism Method,¹⁹ Encircle-test²⁰ Method, and Quantification Method, the invalidity of the aforementioned four syllogistic forms is logically expressed.

Below are the proofs of invalidity of the four syllogistic forms using different methods.

Fallacy of the Square of Opposition

Antilogism Method

Syllogism	Boolean Equation	Antilogistic Equation
All Mangyans are Asians;	$\overline{MA} = 0$	$\overline{MA} = 0$
All Mangyans are Filipinos;	$MF = 0$	$MF = 0$
Therefore, some Filipinos are Asians.	$FA \neq 0$	$FA = 0$

A valid syllogism satisfies the antilogistic requisites. The requisites of a valid categorical syllogism under antilogism method are: [1] Exactly one of the three statements making up its antilogism is an inequality, [2] One of the equalities has a term negated in the other equality, and [3] The quality of the terms in the inequality is the quality of the same terms in the equalities.

For obvious reason, the above-presented syllogism is invalid since it does not satisfy the first requisite. None of the statements making up the antilogism is an inequality.

In the case of the same syllogism evaluated using Encircle-test method, it is valid if it meets the following conditions: [1] Each term is encircled exactly once, and [2] Only one predicate term is encircled.²¹

Encircle-Test Method

Syllogism	Symbolized Form
All Mangyans are Asians;	(M) A A
All Mangyans are Filipinos;	(M) A F
Therefore, some Filipinos are Asians.	(F) I (A)

Because the term 'Mangyans,' represented by 'M,' is encircled twice, the first condition is not met. Hence, the syllogism is invalid.

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This time, the invalidity of the syllogism will be demonstrated using the quantification rules of inference:²²

Quantification Method

Prove:	$(\exists x)(Fx \ \& \ Ax)$	Cn.
Given:		
	1. $(\forall x)(Mx \rightarrow Ax)$	Pr.
	2. $(\forall x)(Mx \rightarrow Fx)$	Pr.
	3. $My \rightarrow Ay$	1 UI
	4. $My \rightarrow Fy$	2 UI
	5. ?	
	INVALID: Cn. cannot be proven.	

THE BREAKDOWN OF THE SQUARE OF OPPOSITION

On the basis of the foregoing discussion, Modern Logic assails the validity of the laws of opposition. The law of Subcontrariety collapses in view of empty classes. Take the pair of the Subcontrary statements: [1] Some mulawins are immortal and [2] Some mulawins are not immortal. The first, being an existential or particular statement 'I', tells us that there exists at least one mulawin, and such mulawin is immortal; the second, also an existential particular statement 'O', tells us that there exists at least one mulawin, and such mulawin is not immortal. Whereas, there is no such being as mulawin in reality, and so both statements are false.²³ Thus, there is a case where the law of subcontrariety breaks down since in this case the subcontraries are both false at the same time. It is quite clear then that the law of subcontrariety does not hold on when a statement speaks of classes having no members at all. In fact, below is the quantified expression of the statements in instantiated form illustrating the third and fourth [truth-falsity combination] rows when I and O are both false.²⁴

Fallacy of the Square of Opposition

Subcontraries

'I' Statement

Ma	&	Ia
t	T	t
t	F	f
f	F	t
f	F	f

'O' Statement

Ma	&	- Ia
t	F	f t
t	T	t f
f	F	f t
f	F	t f

In a syllogistic form, the argument is presented below:

*Subcontraries cannot be both false simultaneously;
I and O can be both false simultaneously;
Therefore, I and O are not subcontraries.*

In like manner, the law of contrariety would not hold, where the contraries can be both true simultaneously. If both I and O are false, then their contradictories E and A, respectively, are both true. The simultaneous truth of A and E is a blatant violation of the law contrariety as illustrated by third and fourth rows below:

Contraries

'A' Statement

Ma	→	Ia
t	T	t
t	F	f
f	T	t
f	T	f

'E' Statement

Ma	→	- Ia
t	F	f t
t	T	t f
f	T	f t
f	T	t f

In a syllogistic form, the argument is presented below:

*Contraries cannot be both true simultaneously;
A and E can be both true simultaneously;
Therefore, A and E are not contraries.*

If the horizontal relations in the square of opposition do not hold, neither do the vertical relations given the aforementioned instance when the falsity of I and O statements does not necessarily imply the falsity of A and E statements respectively nor

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the truth of A and E statements may imply the falsity of I and O statements respectively. The third and fourth truth-falsity combination rows below present that: [1] If A is true, then I is false; or [2] if I is false, then A is true. This situation likewise applies to statements E and O. With this, the law of subalternation collapses.

Subalterns

'A' Statement		'I' Statement
Ma → Ia		Ma & Ia
t T t		t T t
t F f		t F f
f T t		f F t
f T f		f F f

In a syllogistic form, the argument is presented below:

The truth of the subalternan necessarily implies the truth of the subalternate;
The truth of A does not necessarily imply the truth of I;
Therefore, A and I are not subalterns.

or

The falsity of the subalternate necessarily implies the falsity of the subalternan;
The falsity of I does not necessarily imply the falsity of A;
Therefore, I and A are not subalterns.

Therefore, only the diagonal relations governed by the law of contradiction remain of the original square, resulting to the almost complete breakdown of the Aristotelian oppositional relations. There is no [truth-falsity combination] row below demonstrating that A is true and O is also true, or O is false and A is also false. The case of statements E and I may also be tested in the same wise.

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Contradictories

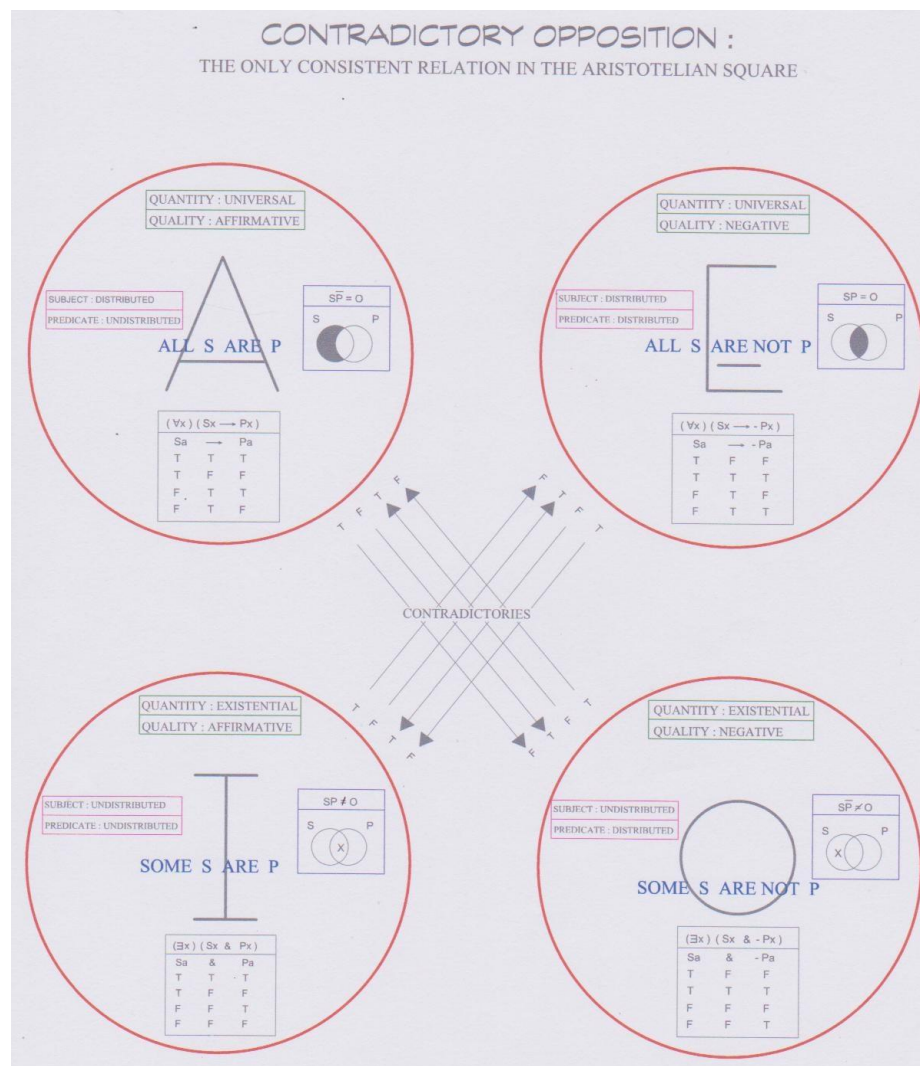
'A' Statement

Ma	→	Ia
t	T	t
t	F	f
f	T	t
f	T	f

'O' Statement

Ma	&	-	Ia
t	F	f	t
t	T	t	f
f	F	f	t
f	F	t	f

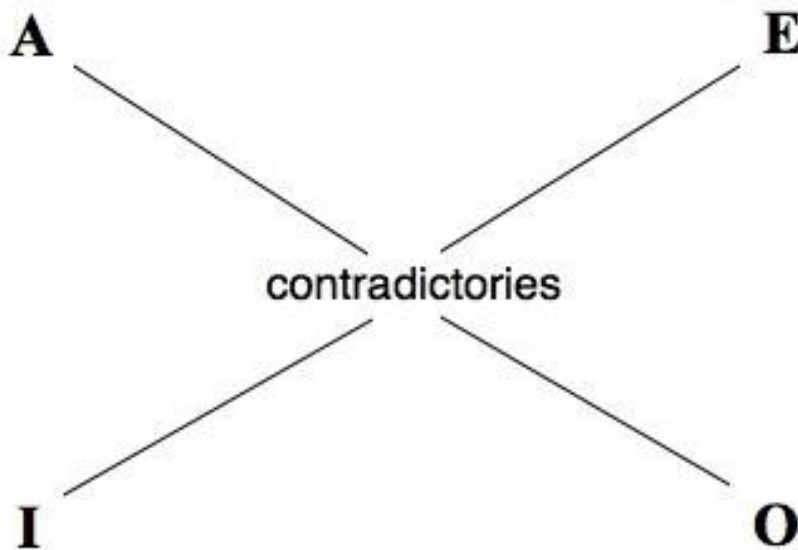
Moreover, as contradictories, A and O are opposites in all aspects not just in truth values. In effect, the contradiction relation as the only relation left would mark an era of new reasoning with the framework of the 'Contradictory Opposition' governed by law of contradiction as the only law of opposition preserved.



Fallacy of the Square of Opposition

However, I argue that as a necessary consequence of the absence of existential import in a 'class' used, truth value cannot be considered false or true because it has no truth value at all. For instance in the proposition 'Some gremlins are politicians,' to consider this false is to assert that there are gremlins and such gremlins are not politicians, and to consider this true is to assert that there are gremlins and these gremlins are politicians, but there are no existing gremlins in the first place; So, even the modern square governed by the law of contradiction will not work because the law of contradiction still depends on truth-value system. In fact, the Modern Square of Opposition is a misnomer [since it is so elementary to describe a square as a polygon with four equal sides] because it has no side at all, and therefore, not a square. Do an ocular inspection below and see for yourself if there is a square or simply an 'X.'

The Modern Square of Opposition



Fallacy of the Square of Opposition

CONCLUDING REFLECTIONS

The downfall of the oppositional relationships provides a proof of the logical illusion of Aristotle or the loophole of Traditional Logic. The laws of opposition, that have been considered the measures of logically deductive inferences, are practically almost totally logical deceptions. If the laws of subcontrariety, contrariety, and subalternation [and may be contradiction] have collapsed, the square of opposition has also collapsed; hence, Aristotle's square of opposition is a fallacy.²⁵ Meaning, the square of opposition has errors and in itself an error. From the "Fallacy of the Square of Opposition," we can logically deduce certain additional fallacies namely: [1] Fallacy of Subcontrariety, [2] Fallacy of Contrariety, and [3] Fallacy of Subalternation. These are the "Fallacies in the Square of Opposition."

The unconcealment of the breakdown of the square of opposition marks a rupture and the opening of avenues of alternative reasoning. This critical and analytical exposition aims not simply to unearth the defects of Aristotelian Logic, but to imply a realization that things around us could have been and still be different, that there could have been better alternative reasoning than what we have called, adopted and worshipped [**Greek**] logic.

[I]n a logical system different from ours, our moronism is wisdom. The whole history of logic consists of attempts to define an acceptable notion of moronism. A task too immense, every great thinker is someone else's moron.

Umberto Eco,
Foucault's Pendulum

NOTES

1. The term 'fallacy' has been coined by an Ancient thinker, Protagoras, which means error in reasoning. It has an etymological origin from non-English words fallo/fallacia/fallare meaning deception. Fallacies may be intentional [sophism] or unintentional [paralogism]. I am not that certain if Aristotle committed sophism or paralogism.

2. Contraries are universal statements that differ from each other in quality.

3. Subcontraries are existential statements that differ from each other in quality.

4. Subalterns are statements that differ from each other in quantity but not in quality.

5. Contradictories are statements that differ from each other both in quantity and in quality.

6. The implication of the Laws of Opposition would be: [1] If A is true, O is false, E is false, I is true; [2] If E is true, I is false, A is false, O is true; [3] If I is false, E is true, A is false, O is true; [4] If O is false, A is true, E is false, I is true; [5] If A is false, O is true, E is undetermined, I is undetermined; [6] If E is false, I is true, A is undetermined, O is undetermined; [7] If I is true, E is false, A is undetermined, O is undetermined; [8] If O is true, A is false, E is undetermined, I is undetermined.

7. A categorical syllogism is made up of major premise, minor premise and conclusion. It also contains three and only three terms used univocally. The major term appears in the major premise and as the predicate term of the conclusion; the minor term appears in the minor premise and as the subject term of the conclusion; the middle term appears in both premises but not in the conclusion.

8. Mood refers to the arrangement of syllogistic propositions. It refers to the manner according to which the three propositions in a syllogism may be arranged considering their quantity and quality. There are 64 moods.

9. Figure refers to the arrangement of syllogistic terms. The middle term is designated by 'M', the minor term by 'S' and the major term by 'P.' There are 4 syllogistic figures. In the first figure, the middle term is the subject term of the major premise and the predicate term of the minor premise; In the second figure, the middle term is the predicate term of both premises; in the third figure, the middle term is the subject term of both premises; In the fourth figure, the middle term is the predicate term of the major premise and the subject term of the minor premise.

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10. The syllogistic form constitutes the figure and the mood. It refers to the figure-mood combination.

11. Fallacy of Undistributed Middle is a logical error committed when the middle term is never distributed.

12. Fallacy of Illicit Major is a logical error committed when the major term is distributed in the conclusion but not in the major premise; Fallacy of Illicit Minor is a logical error committed when the minor term is distributed in the conclusion but not in the minor premise.

13. Fallacy of Exclusive Premises is a logical error committed when both the major and minor premises are negative in quality.

14. Fallacy of Illicit Negative is a logical error committed when an affirmative conclusion is drawn from a negative premise.

15. The Boolean Equations are:

Boolean Equation	Interpretation
$\overline{SP} = 0$	Subjects that are not Predicates is equal to zero.
$SP = 0$	Subjects that are Predicates is equal to zero.
$\underline{SP} \neq 0$	Subjects that are Predicates is not equal to zero.
$SP \neq 0$	Subjects that are not Predicates is not equal to zero.

16. Fallacy of Illicit Existence is a logical Error committed when an existential conclusion is drawn from two universal premises.

17. These are the four traditionally valid syllogistic forms that are invalid under Modern Logic.

Name	Form
Darapti	AAI – 3
Felapton	EAO – 3
Bramantip	AAI – 4
Fesapo	EAO – 4

18. The 15 Valid Syllogistic Forms:

Name	Form
Barbara	AAA – 1
Celarent	EAE – 1
Darii	AII – 1
Ferio	EIO – 1
Camestres	AEE – 2

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Cesare	EAE – 2
Baroko	AOO – 2
Festino	EIO – 2
Datisi	AII – 3
Disamis	IAI – 3
Ferison	EIO – 3
Bokardo	OAO – 3
Camenes	AEE – 4
Dimaris	IAI – 4
Fresison	EIO – 4

19. Antilogism has been popularized by Christine Ladd-Franklin.

20. Encircle-test Method has been developed by the writer of this paper himself based on Harry Gensler's Method.

21. Here are the steps in the application of Encircle-test Method: [1] Symbolize the syllogism, [2] Encircle all the distributed terms in the premises, and [3] Encircle the undistributed terms in the conclusion.

22. **UI** or Universal Instantiation/Universal Elimination is a rule of inference that permits the valid inference of any substitution instance of a propositional function from the universal quantification of the propositional function.

23. The issue on existential import gave birth to what contemporary logicians now called 'Modern Square of Opposition.' In this new oppositional paradigm, only the Law of Contradiction holds. The laws of contrariety, subcontrariety, and subalternation are inoperative.

24. The Truth Tables for conjunctive and conditional propositions:

N	P	N & P	N → P
T	T	t T t	t T t
T	F	t F f	t F f
F	T	f F t	f T t
F	F	f F f	f T f

25. The term 'fallacy' has been coined by an Ancient thinker, Protagoras, which means error in reasoning. It has an etymological origin from non-English words fallo/fallacia/fallare meaning deception. Fallacies may be intentional [sophism] or unintentional [paralogism]. I am not that certain if Aristotle committed sophism or paralogism.

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Given this 14th day of January, 2021.


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