



PADHO TO AISE

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CHAPTER-6
Logical Reasoning



PADHO TO AISE



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21. Understanding the Structure of Arguments

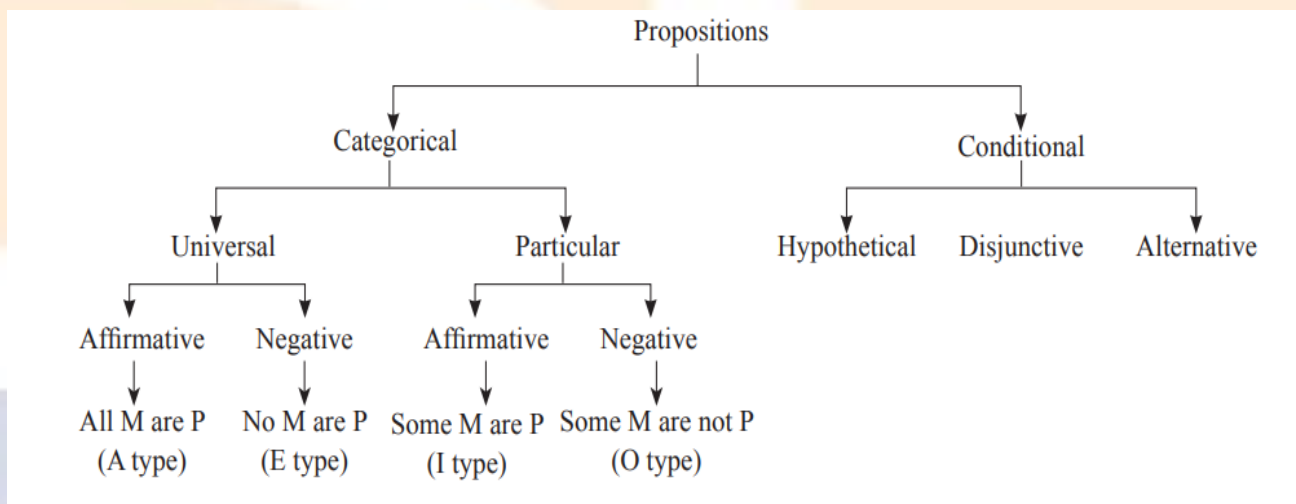
Syllogism is a Greek word that means 'inference' or 'deduction'. The problems of syllogism are based on two parts :

1. Proposition(s) Major Premise, Minor Premise
2. Conclusion(s) drawn from given proposition(s)

A proposition is a statement giving a relation between two terms. It has three parts :

- (a) the subject
- (b) the predicate
- (c) the copula [is/ are (not)]

Types of Propositions



CATEGORICAL PROPOSITION

Parts	Example
Major premise	All humans are mortal
Minor premise	All Indians are humans

Conclusion	All Indians are mortal
------------	------------------------

1. Major premise:

Predicate of the conclusion is called as the major term. The premise containing major term is called major premise. In the example, mortal is the major term.

2. Minor premise: Subject of the conclusion is called minor term. The premise containing minor term is called minor premise. In the example, Indians is the minor term.

3. Middle term: One term common in both the premises is called middle term . It is not a part of conclusion. In the example, humans is the middle term. Constituents of Categorical Proposition Besides these, the categorical propositions in the traditional classification of propositions have two important elements also, quantity and quality.

Quantity

Quantity refers to the number of members in the class represented by the subject term **universal** of a proposition. It may refer to all the members of a class or to some of the members of a class particular.

Quality

Quality of a proposition indicates whether a proposition is affirmative or negative.

Types of Categorical Proposition Quantity and Quality together give four types of categorical proposition:

1. Universal affirmative----- A
2. Universal negative----- E
3. Particular affirmative----- I
4. Particular negative----- O

CONDITIONAL PROPOSITIONS

A conditional proposition is that in which a predicate is assigned or denied to the subject on certain conditions. For instance, “If it rains in time, then crops will be good”, “Sita will not go unless she is invited”, “Either I will go to watch the movie or sit in the coffee house”, “If Mohan is graduate, then he is eligible for this post.” etc.

MOOD AND FIGURES

Mood of Syllogism

The mood of a syllogism is determined by the quantity and the quality of its constituent propositions or by the types of (A, E, I, O) standard form categorical propositions it contains. The mood of the syllogism is represented by three letters given in standard form order. The first letter represents the type of major premise, the second letter is for the minor premise and the last letter is for the conclusion.

Some Common moods are AAA, IAI, AEE, IEO etc.

Figure of Syllogism

The figure of a syllogism is determined by the position of the middle term in its premises. The middle term occurs in both the major and the minor premises but the position of the middle term is not the same in all syllogisms. There are four possible arrangements of the middle term in the two premises and, thus, there are four figures of a syllogism:-

First Figure

In the first figure, the middle term is the subject of the major premise and predicate of the minor premise. Thus,

M P

S M

So, S is P

Second Figure

In the second Figure, the middle term is the predicate in both the premises. Thus,

P M

S M

So, S is P

Third Figure

In the third figure, the middle term is the subject in both the premises. Thus,

M P

M S

So, S is P

Fourth Figure

In the fourth figure, the middle term is the predicate in the major premise and subject in the minor premise. It is exactly the opposite of the first figure. Thus,

P M

M S

So, S is P

SOLVING PROBLEMS CONVERSION OF PROPOSITIONS

Before solving the problems of syllogism, it is a must to know the conversion rules of all A, E, O, and I types of propositions :

Conversion of A type:

Subject Predicate
↑ ↑
“All M are P” (A type)

After conversion it becomes.

Subject Predicate
↑ ↑
“Some P are M” (I type)

Therefore, it is clear that A type of propositions get converted into I type.

Conversion of E type :

Subject Predicate
↑ ↑
“No (M) are (P)” (E type)

After conversion it becomes

Subject Predicate
↑ ↑
“No (P) are (M)” (E type)

Therefore, E gets converted into E. “sss”

Conversion of I type :

Subject Predicate
↑ ↑
“Some (M) are (P)” (I type)

After conversion it becomes

Subject Predicate
↑ ↑
“Some (P) are (M)” (I type)

Therefore, I gets converted into

I. Conversion of O type :

O type of proposition can't be converted.

Conclusion Table

I Proposition	II Proposition	Conclusion
A	A	A
A	E	E
E	A	(O) ^R
E	I	(O) ^R
I	A	I
I	E	O

A. ANALYTICAL/ ALIGNING METHOD OF SOLVING PROBLEMS

This method has two main steps :

- (a) Aligning the pair of sentences.
- (b) Using conclusion table to draw conclusion.

What is Aligning ?

Aligning of two statements (propositions) means that the pair of statements must be written in such a way that the common term is the predicate of the 1st sentence and the subject of the 2nd., e.g.,

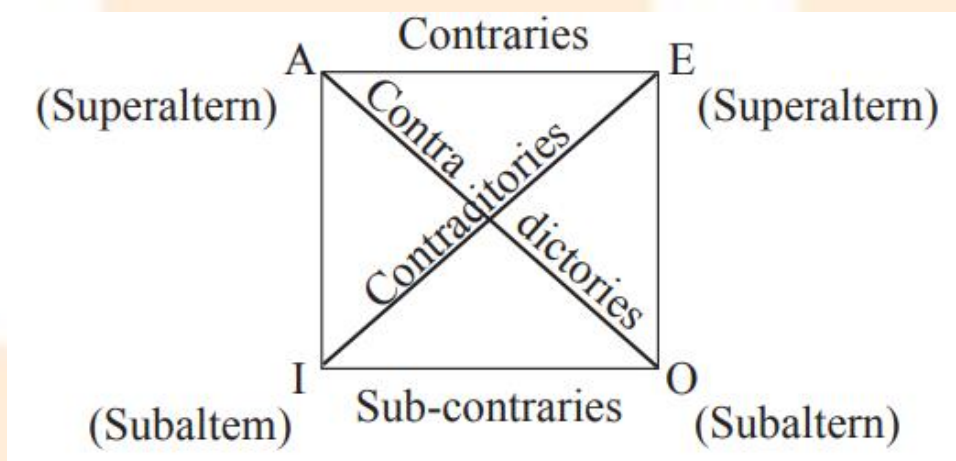
Statements :

- I. Some girls are cute .
- II. All cute are tall.

Here, the common term cute is the predicate of the I statement and subject of the 2nd statement. Therefore, the two statements (I & II) are properly aligned.

SQUARE OF OPPOSITION

Four categorical propositions A, E, I and O are related and at the same time different from each other. The relation among them is explained by the following diagram called the “Square of Opposition”.



Two categorical propositions are said to be opposite if they differ in:

1. Quantity
2. Quality
3. Both Quantity and Quality

The pair of AI and EO differs in quantity but not in quality. AI has same quality; both are affirmative but A is universal and I is particular. Similarly EO have same quality; both are negative but E is universal and O is particular. AE and IO differ in quality. Both AE

are universal in quantity but A is affirmative and E is negative. Similarly both IO are particular; they have same quantity but I is affirmative and O is negative. The pairs AO and EI, however, differ both in quality and quantity.

Contrary Propositions

Universal affirmative A proposition, “All S is P” and universal negative E proposition, “No S is P” are related to each other by the contrary relation. The proposition “All basket ball players are tall” is contrary to “No basket ball players are tall”. Similarly, “No lion is black” is contrary to “All lions are black”.

Sub-Contrary Propositions

Particular affirmative I proposition, “Some politicians are well read scholars” is related to O proposition, “Some politicians are not well read scholars” by sub-contrary relation. Similarly O proposition, “Some animals are not carnivorous” is related to I proposition, “Some animals are carnivorous” by sub-contrary relation.

Subaltern and Superaltern

Propositions Universal affirmative A proposition, “All army generals are soldiers” is superaltern to I proposition, “Some army generals are soldiers”. Similarly, E proposition, “No fish is mammal” is superaltern to O proposition, “Some fish are not mammals”. But I is related to A by subaltern and similarly O is related to E by subaltern. “Some cats are mammals” is subaltern

to “All cats are mammals.” Similarly, “Some roses are not red things.” is subaltern to “No roses are red things.”

Contradictory Propositions

The universal affirmative A proposition, “All S is P” is related to particular negative O proposition, “Some S is not P” by contradictory relation. The contradictory of “All men are mortal” is “Some men are not mortal” and vice versa. The contradictory of E proposition, “No egg is red” is I proposition, “Some eggs are red”.

1. “All S is P” is contrary to “No S is P” and vice versa.
2. “Some S is P” is sub-contrary to “Some S is not P” and vice versa.
3. (i) “All S is P” is contradictory to “Some S is not P” and vice versa.
(ii) “No S is P” is contradictory to “Some S is P” and vice versa.
4. (i) “Some S is P” is subaltern to “All S is P”.
(ii) “Some S is not P” is subaltern to “No S is P”.
5. (i) “All S is P” is superaltern to “Some S is P”.
(ii) “No S is P” is superaltern to “Some S is not P”.

22. Evaluating and Distinguishing Deductive and Inductive Reasoning

Deductive reasoning, or deduction, is making an inference based on widely accepted facts or premises. If a beverage is defined as “drinkable through a straw,” one could use deduction to determine soup to be a beverage.

Inductive reasoning, or induction, is making an inference based on an observation, often of a sample. You can induce that the soup is tasty if you observe all of your friends consuming it. Abductive reasoning, or abduction, is making a probable conclusion from what you know. If you see an abandoned bowl of hot soup on the table, you can use abduction to conclude the owner of the soup is likely returning soon.

Deduction is generally defined as “the deriving of a conclusion by reasoning.” Its specific meaning in logic is “inference in which the conclusion about particulars follows necessarily from general or universal premises.” Or we can say that deduction — or the process of deducing is the formation of a conclusion based on generally accepted statements or facts. Deductive reasoning always follows necessarily from general or universal premises.

Induction is a method of reasoning involving an element of probability. In logic, induction refers specifically to “inference of a generalized conclusion from particular instances.” In other words, it means forming a generalization based on what is known or

observed. So it always follows the particular to general path.

Abduction, is defined as “a syllogism in which the major premise is evident but the minor premise and therefore the conclusion only probable.” Basically, it involves forming a conclusion from the information that is known. A familiar example of abduction is a detective’s identification of a criminal by piecing together evidence at a crime scene.

23. Analogies

Analogy is an inductive mechanism based on structured comparisons of mental representations. It is an important special case of role-based relational reasoning, in which inferences are generated on the basis of patterns of relational roles. Analogical reasoning is a complex process involving retrieval of structured knowledge from long-term memory, representing and manipulating role-filler bindings in working memory, identifying elements that play corresponding roles, generating new inferences, and learning abstract schemas. For empirical analogies, analogical inference is guided by causal knowledge about how the source analog operates. Simpler types of relation-based transfer can be produced by relational priming. Analogy is a cognitive process of transferring information or meaning from a particular subject (the analog, or sources) to another (the target T), or a linguistic expression corresponding to such a process. In a narrower sense, analogy is an inference or an argument from one particular to another particular, as opposed to deduction, induction, and abduction, in which at least one of the premises, or the conclusion, is general rather than particular in nature. The term analogy can also refer to the relation between the source and the target themselves, which is often (though not always) a similarity, as in the biological notion of analogy.

POSITIVE ANALOGY

Let P stand for a list of accepted propositions P_1, \dots, P_n about the source domain S . Suppose that the corresponding propositions P^*_1, \dots, P^*_n , abbreviated as P^* , are all accepted as holding for the target domain T , so that P and P^* represent accepted (or known) similarities. Then we refer to P as the positive analogy.

NEGATIVE ANALOGY

Let A stand for a list of propositions A_1, \dots, A_r accepted as holding in S , and B^* for a list B^*_1, \dots, B^*_s of propositions holding in T . Suppose that the analogous propositions $A^* = A^*_1, \dots, A^*_r$ fail to hold in T , and similarly the propositions $B = B_1, \dots, B_s$ fail to hold in S , so that $A, \sim A^*$ and $\sim B, B^*$ represent accepted (or known) differences. Then we refer to A and B as the negative analogy.

NEUTRAL ANALOGY The neutral analogy consists of accepted propositions about S for which it is not known whether an analogue holds in T . Hypothetical analogy The hypothetical analogy is simply the proposition Q in the neutral analogy that is the focus of our attention.

PLAUSIBLE REASONING

It is a method of deriving new conclusions from given known premises, a method different from the classical syllogistic argumentation methods of Aristotelian two-valued logic. The syllogistic style of argumentation is illustrated by the oft-quoted argument "All men are mortal, Akhil is a man, and therefore, Akhil is mortal." In contrast, consider the statement "if it is raining then

it is cloudy.” The only logical inference that one can draw from this is that “if it is not cloudy then it is not raining.” But ordinary people in their everyday lives would conclude that “if it is not raining then being cloudy is less plausible,” or “if it is cloudy then rain is more plausible.” The unstated and unconsciously applied reasoning, arguably incorrect, that made people come to their conclusions is typical of plausible reasoning.

CONNOTATIONS AND DENOTATIONS OF TERMS

In logic and semantics, connotation is roughly synonymous with intension. Connotation is often contrasted with denotation, which is more or less synonymous with extension. Alternatively, the connotation of the word may be thought of as the set of all its possible referents (as opposed to merely the actual ones). A word’s denotation is the collection of things it refers to; its connotation is what it implies about the things it is used to refer to. The denotation of dog is (something like) four-legged canine carnivore. So saying, “You are a dog” would connote that you were ugly or aggressive rather than literally denoting you as a canine.

Fact

A fact is verifiable. We can determine whether it is true by researching the evidence.

Opinion

An opinion is a judgment based on facts, an honest attempt to draw a reasonable conclusion from factual evidence. Unlike an opinion, a belief is a conviction based on cultural or personal faith, morality, or values. They cannot be disproved or even contested in a rational or logical manner.

Prejudice

Another kind of assertion that has no place in serious argumentation is prejudice, a half-baked opinion based on insufficient or unexamined evidence. Unlike a belief, a prejudice is testable: it can be contested and disproved on the basis of facts.

TYPES OF FALLACIES

Non Sequitur: When a conclusion is supported only by extremely weak reasons or by irrelevant reasons, Example: Nuclear disarmament is a risk.

Masked-Man Fallacy

In philosophical logic, the masked-man fallacy (also known as the intentional fallacy and the epistemic fallacy) is committed when one makes an illicit use of Leibniz's law in an argument. Leibniz's law states that if A and B are the same object, then A and B are indiscernible (that is, they have all the same properties). By modus tollens, this means that if one object has a certain property, while another object does not have the same property, the two objects cannot be identical. The fallacy is "epistemic" because it postulates an immediate identity between a subject's

knowledge of an object with the object itself, failing to recognize that Leibniz's Law is not capable of accounting for intentional contexts.

Example:

The name of the fallacy comes from the example:

Premise 1: I know who Bob is.

Premise 2: I do not know who the masked man is

Conclusion: Therefore, Bob is not the masked man. The premises may be true and the conclusion false if Bob is the masked man and the speaker does not know that. Thus, the argument is a fallacious one.

Bad Reason Fallacy

The bad reasons fallacy stems from the claim that because the reason(s) given for a certain conclusion are bad therefore the conclusion must also be incorrect. This fallacy supposes that it is not possible to give a bad reason for a correct conclusion. In fact, it is possible to give bad reasoning for a valid conclusion.

Example: Kiwi can not fly so it is not a bird.

Syllogistic Fallacies

When logical fallacies occur in the syllogisms of deductive reasoning. This occurs with a reference to something general, and then makes a conclusion about something more specific.

Example:

All sharks are fish (All S are P.) All salmon are fish (All x are P).
Therefore, all salmon are sharks. (All x are P.)

Quantification Fallacies

Error in logic where the quantifiers of the premises are in contradiction to the conclusion's quantifiers. An example of such a fallacy is when the argument has a universal premise and a particular conclusion. That is, the premise(s) do not justify the conclusion(s).

Example: All monkeys love some dogs.

Begging the Question

A form of circular reasoning in which a conclusion is derived from premises that presuppose the conclusion. Normally, the point of good reasoning is to start out at one place and end up somewhere new, namely having reached the goal of increasing the degree of reasonable belief in the conclusion. The point is to make progress, but in cases of begging the question there is no progress.

Example: "Women have rights," said the Bullfighters Association president. "But women shouldn't fight bulls because a bullfighter is and should be a man."

False Dilemma

A reasoner who unfairly presents too few choices and then implies that a choice must be made among this short menu of

choices is using the False Dilemma Fallacy, as does the person who accepts this faulty reasoning.

Example: In a restaurant a vegetarian person got all non veg items.

No True Scotsman

This error is a kind of Ad Hoc Rescue of one's generalization in which the reasoner re-characterizes the situation solely in order to escape refutation of the generalization.

Example:

A: All XYZ are loyal and brave.

B: But Bravo over there is a XYZ, and he was arrested by his commanding officer for running from the enemy.

A: Well, if that's right, it just shows that Bravo wasn't a TRUE XYZ.

Ambiguity Any fallacy that turns on ambiguity. The fallacies of Amphiboly, Accent, and Equivocation are examples of ambiguity. Amphiboly is ambiguity of syntax. Equivocation is ambiguity of semantics. Accent is ambiguity of emphasis.

Ad Hominem The ad hominem attack is a logical fallacy associated with trying to undermine the opponent's arguments by personal attacks, through attacking their character or skill level, etc. The ad hominem attack uses an accepted fact about a person to undermine their credibility despite the lack of causal connection between the two parts of the argument.

Example:

Mr Z claims that this was an accident, but we know Mr Z to be a liar, so we can't take his word for it. Even though Mr Z may be a liar, his character does not automatically make anything he says untrue.

Anecdotal

The anecdotal fallacy uses a personal experience or an isolated example instead of a sound argument.

Example:

Mr A thinks smoking does not affect life expectancy since his grandmother smoked for 4 decades and lived to be 87. The fact that Mr A's grandmother did not die of cancer or other kind of disease, does not mean that someone else with the same behaviour would have had the same result.

Appeal to Ridicule

Appeal to Ridicule is an informal fallacy which claims an argument to be ridiculous or absurd. The fallacy uses this claim in an attempt to invalidate the argument since it is not worth entertaining. Appeal to ridicule can be used in conjunction with other fallacies such as appeal to emotion. Sarcasm can also be used as a means of appeal to ridicule. GP_4358 Analogies V.

Example: Everyone should wear seatbelts. We should also wear neck guard and sleep in a bunker.

False Cause & False Attribution

False cause refers to an argument where someone cites sequential events as evidence that the first event caused the second. False attribution happens when someone appeals to irrelevant, biased, or unqualified information.

Example:

False Cause: I eat fruits for breakfast every day. One day I skipped my fruit, and my car was broken into. I have not missed a day of fruit breakfast since.

False Attribution: Amit given me this book that proved scientists have empirical evidence for the existence of Yati, but I lost the book and don't remember the title.

Ignoratio Elenchi

Also called Irrelevant Conclusion, the ignoratio elenchi fallacy reaches a relevant conclusion but misses the point. Though the claims and conclusion may be logically valid, they do not address the point in question.

Example

Hippos can't be dangerous to humans, because they are so calm. The fact is exactly opposite of it as Hippos are responsible for one of the largest humans kills in Africa.

Appeal to Tradition

As the name suggest this fallacy relies on tradition to prove a point, arguing that a thesis must be correct because it has traditionally been so.

Example: “Everyone in our family has attended the University of Delhi, so you must do the same.”

Tu Quoque

Tu quoque is a fallacy answering criticism with criticism or turning the argument back around on the other person. It also applied the logic that because someone has done something, that it justifies someone else doing the same thing.

Example:

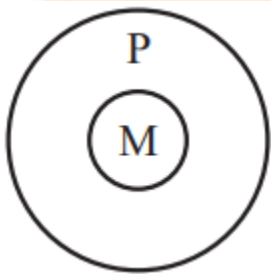
A: You cheated on your exam. Don't you know that is wrong?

B: Didn't you cheat on your exam last time?

24. Venn Diagram

All A, E, I and O type of propositions can also be represented in pictorial way and this method is known as Venn diagram.

(i) Representation of “All M are P” (A type):



(ii) Representation of “No M are P” (E type):



(iii) Representation of “Some M are P” (I type): This representation will be in two ways:

Either (a):



Or (b):

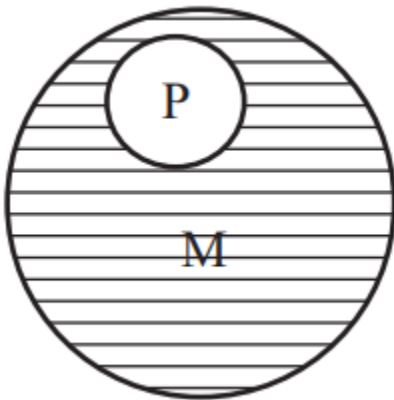


(iv) Representation of “Some M are not P” (O type): This representation will be in three ways:

Either (a):



Or (b) :



Or (c):



How to solve?

Statements:

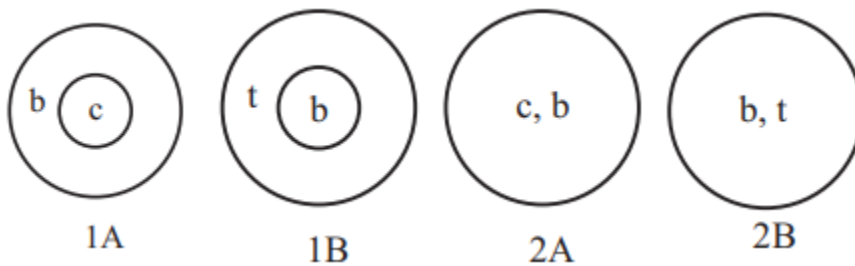
A. All chairs are books.

B. All books are ties.

Conclusions:

- I. Some ties are books.
- II. Some ties are chairs.

1st Step:



Here, 1A and 2A are representations for statement A while 1B and 2B are representations for statement B. In these representations

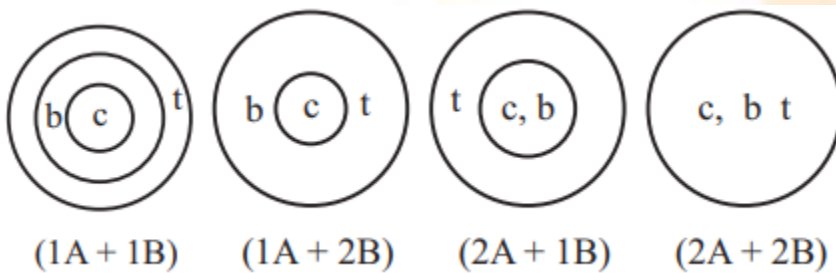
b = books

c = chairs

t = ties

2nd step:

Let us combine all the possible pairs of this pictorial representations:



3rd step:

When we interpret the pictures in step II, we find that all the pictures support both the conclusions. Therefore,

conclusion I: “Some ties are books” and

conclusion II. “Some ties are chairs” both are true.

Important Note: In the Venn diagram method, any conclusion given with any problem will be true if and only if it is supported by all the combined pictorial representations through 2nd step. If any pictorial representation contradicts the given conclusion, it will be put in the category of incorrect or wrong conclusion.

Now take another problem:

Statements:

A. Some tigers are wolves.

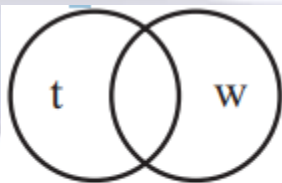
B. Some wolves are lions.

Conclusion:

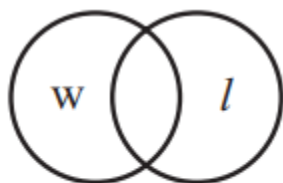
I. Some tigers are lions.

II. Some tigers are not lions

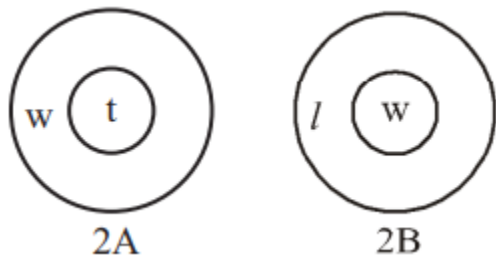
Sol. 1st step:



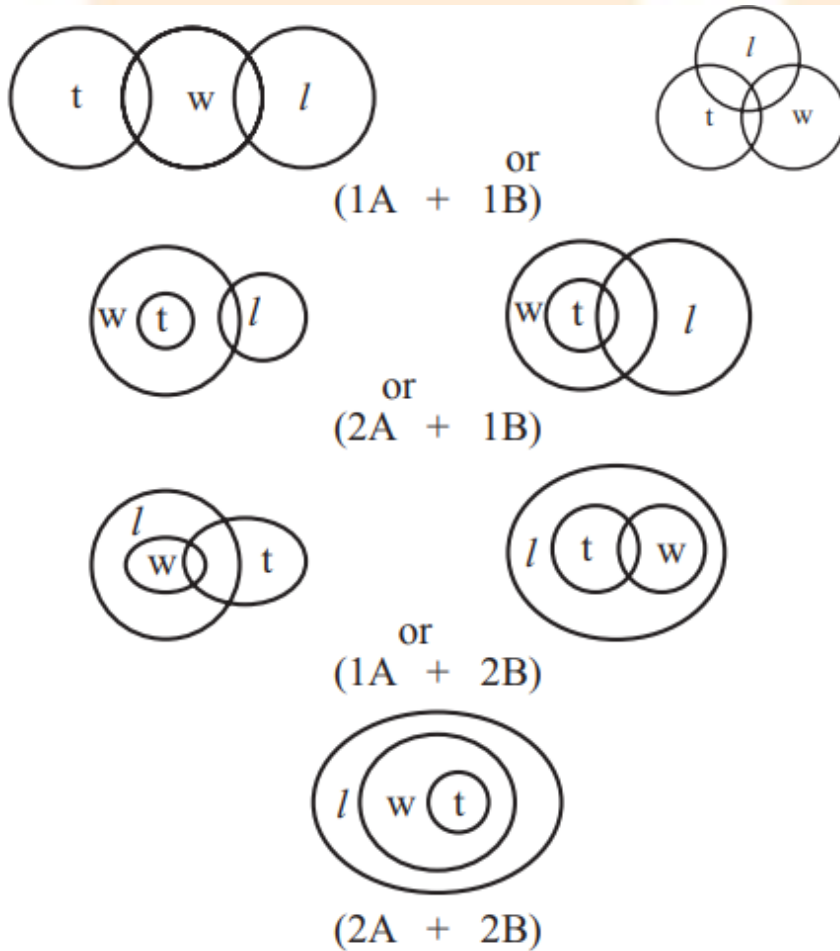
1A



1B



2nd step:



POSSIBILITY CASE:

When the term possibility arises in conclusion, we need to check:

- When “Some Relation” is given in statement and “All” is desired in the conclusion [POSSIBILITY=TRUE]

• When “No Relation” is given in statement and “All/Some” is desired in the conclusion [POSSIBILITY=TRUE]

In a statement these words are possibilities:

- Can be
- Possible
- May be / might be
- Chances
- Occurs
- is being a possibility
- is a possible

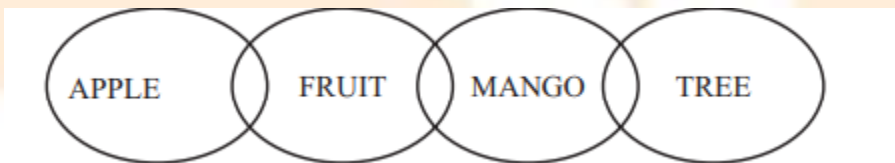
In a statement these words are sureties:

Can Never be

Can


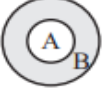
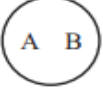

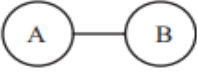


Statement: Some Apple is Fruit. Some Fruit is Mango. Some Mango is Tree

Venn diagram:



Conclusion:

- (a) Some Apple being Mango is a possibility.
- (b) Some Mango being Apple is a possibility.
- (c) Some Apple being Tree is a possibility.
- (d) Some Tree being Apple is a possibility.
- (e) Some Fruit being Tree is a possibility.
- (f) Some Tree being Fruit is a possibility.

Universal Affirmative	Particular Affirmative	Universal Negative	Particular Negative
<p>Direct Statement: All A's are B's</p>  <p>(1) Definite conclusion a) Some A's are B's b) Some B's are A's (i.e. These conclusions are sure conclusions without any doubt) (2) Possible conclusions a) Some B's are not A's is a possibility</p>  <p>b) All B's are A is a possibility. i.e.</p> 	<p>Direct Statement: Some A's are B's</p>  <p>1) Definite conclusions a) Some B's are A's 2) Possible conclusion a) Some A's are not B is a possibility b) Some B's are not a is a possibility c) All A's are B's is a possibility d) All B's is A is a possibility</p>	<p>Direct Statement: All A's are not B's</p>  <p>1) Definite conclusions a) All B's are not A b) Some A's are not B c) Some B's are not A Note : Since there is no relation between A&B ∴ No possibility are definite conclusions</p>	<p>Direct Statement: Some A's are not B's</p>  <p>1) Definite conclusion none as nothing definite can be said from the diagram. All are a possibility 2) Possible conclusions a) Some A's are B's is a possibility b) Some B is A is a possibility c) Some B is not equal to A is a possibility d) All A is not equal to B is a possibility e) All B is not equal to A is a possibility f) All B is equal to A is a possibility</p>  <p>Note: Vice-Versa is not a possibility i.e. All A is equal to B as the direct statements itself states that some A is not equal to B".</p>

REVERSE SYLLOGISM

Reverse syllogism is nothing but another version of syllogism in which conclusions are given and we have to find the appropriate statements which satisfies the conclusions.

Illustration

Conclusions:

- I. All A can never be B
- II. Any A which is a D is also C

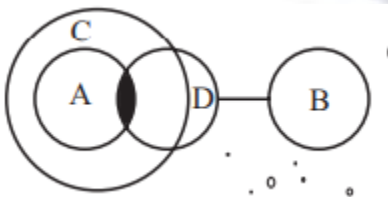
Statements:

- A. Some A is
- B. All B is C. Some C is D.
- B. Some A are D. All A are C. No B is D.
- C. No A is C. All C are B. Some C is D.
- D. All A are C. Some C are D. No D is B.
- E. None of these

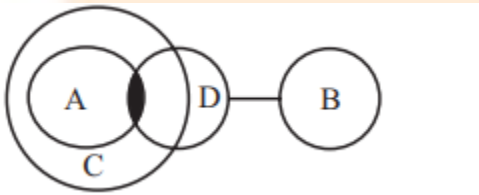
Answer: Option B

Explanation:

- First let us take a quick scan on the statements
- Take option A and compare it with conclusion I. **All A can never be B. Some A is B.** All B is C. Some C is D (option A is eliminated)
- Take option C and compare it with conclusion II. Any A which is a D is also C. No A is C. All C are B. Some C is D (option C is eliminated)
- Now we have option B and D.
- Take option B and compare with both the conclusions. Some A are D. All A are C. No B is D



- From the shaded region it is clear that all A can never be B and any A which is D is also C. (Both conclusions follows, so option B is the answer.)
- In exam you can stop once you find the answer.
- But, now let us take option D also and check. All A are C. Some C are D. No D is B.



- Here all A can never be B may or may not be true
- Therefore, option D doesn't follow.

25. Indian Logic: Means of Knowledge

There are nine prominent philosophical schools. Each of them has many sampradaya (sub-schools), and for every system there are authoritative texts and thinkers.

	Philosopher	System	Text
1.	Bachaspati	Carvakadarsana	Brahaspatyasutra
2.	Mahavira	Jainadarsana	Agama sahitya
3.	Siddhartha Gautama	Bauddhadarsana	Buddha Tripitaka
4.	Kapila	Sankhyadarsana	Sankhyadarsana
5.	Patanjali	Yogadarsana	Yoga-sutra
6.	Kanada	Vaisesikadarsana	Vaisesika-sutra
7.	Gautama	Nyayadarsana	Nyaya-sutra
8.	Jaimini	Mimansadarsana	Mimansa-sutra
9.	Badarayana	Vedantadarsana	Vedanta-sutra

There are many schools, they have different people. Therefore, there were different philosophical thoughts, of in several traditions. These are different systems, developed in different times. The people involved in these systems must have different frame of references on an idea or a concept or an event therefore, they have a different opinion and different understanding of a particular concept.

The Indian Philosophical System can be broadly classified into two categories

1. Astika or Orthodox System: It follows the Vedas. People who believe in Veda are known as orthodox people. So, orthodox people in other words can also be termed as Astika because they accept Veda. It has six schools.

- (a) Vaisheshika
- (b) Mimamsa or Purva Mimamsa
- (c) Vedanta or Uttara Mimamsa
- (d) Samkhya
- (e) Yoga
- (f) Nyaya

2. Nastika or Heterodox System: It is a non-vedic system. Heterodox are those who do not believe in the existence of Veda. They said that Veda has no meaning for us. Heterodox people are also known as Nastika because they do not accept Vedas as the scriptures. It has three schools

- (a) Jain
- (b) Buddha
- (c) Carvak or Materialistic Philosophy

Indian Philosophy, is the siddhi sopatha, the ladder for freedom from suffering. All the Indian philosophical systems thus address the problem of dukha in its totality — the real nature of suffering, the real cause(s) of suffering, the state of complete absence of suffering and the means or method of achieving complete absence of suffering. Each philosophical system gives a considered answer to these questions. All systems agree, we have said above,

that right knowledge is the supreme means of liberation, but they differ on the nature of this 'right knowledge': Mimamsa believes that it consists in the proper performance of enjoined acts of duty.

In Vedanta, this knowledge consists in the awareness that all the visible, diverse, multiple forms and objects, both with and without 'life', are reflections of the same one being that permeates the entire universe. Sankhya says that effort must be directed at achieving a discriminating intellect (vivekajñana) which enables us to grasp the true nature of reality as an interface of matter (prakṛti) and energy (puruṣa).

Yoga says this knowledge consists in the ability to discipline and restrain the mind's potential to attach itself to objects of cognition. It teaches, instead, union (yoga) with the higher self; this may be achieved through knowledge of the self (jñana), devotion to a chosen deity (bhakti), or works free from egotism (karma), among other methods. Nyaya says that a proper knowledge of the true nature of reality (tattvartha) enables one to decide what is to be acquired and grasped and what is to be rejected and renounced. The Vaisesika system says that exact knowledge of the material reality (tattvajñana) frees one of the bonds of suffering. The Jaina system talks of samyakadarsana, holistic and balanced knowledge that leads to cessation of action, karma. The Buddhists attribute all sorrow to avidya, ignorance,

and say that the knowledge of what is right action/conduct, *acara*, leads to freedom, *nirvana*.

Caraka was a thinker of medical science but what he says about illness or an ailing person applies to all human beings and all life — after all we all suffer unhappiness or sorrow at one time or the other and therefore we are all ‘ailing’ even if we are ‘fit’ medically. For all, Caraka says: In all ailments, the responsibility is of a physician, but in the mental ailment, it is the patients’ own responsibility. A wise man keeping in mind his own welfare, acts with great care in respect of *dharma*, righteousness, *artha*, material acquisitions, and *kama*, desires. It is these three that are the cause of internal *sukha* or *dukha*. Such a patient should discipline himself and recognize the truth about himself, the *maryada* or limits of his family honour and conduct, the nature of time and place and social and economic strength.

Indian philosophy thus is put to use not to promote man’s physical comfort or material success but to ensure his mental health, the well-being of his spirit (self), to help him realize his full intellectual potential and, finally, to enable him to free one’s self of the binds of time, space and his physical body. This is the ‘practical’ dimension of Indian philosophy.

The period of development of Indian Philosophy can be divided in three periods

1. Vedic
2. Upanishad

3. Uttar Vedic (Post Vedic).

The systematic development happened in Uttar Vedic Period

26. Pramanas

The Orthodox System assumes six main sources of Pramana. Pratyaksha (Perception), Anumana (Inference), Upamana (Comparison), Shabda (Verbal testimony), Arthapatti (Implication) and Anupalabdhi (Non-apprehension). Pramana literally means “proof” and “means of knowledge”. It refers to epistemology in Indian philosophies. It is a theory of knowledge, and encompasses one or more reliable and valid means by which human beings gain accurate, true knowledge. The focus of Pramana is how correct knowledge can be acquired, how one knows, how one doesn't, and to what extent knowledge pertinent about someone or something can be acquired.

PRATYAKSH (PERCEPTION)

Pratyaksh or Perception is direct source of knowledge. It is what you see, what are things that exist in this world; then, you accept its validity and henceforth, you have a knowledge about that object. It enable a person to have correct cognitions of the world. Pratyaksha is of two kinds, direct perception (anubhava) and remembered perception (smriti). Some schools make a further distinction between indiscriminate perception (nirvikalpaka), in which the object is perceived without its distinguishing features, and discriminate perception (savikalpaka), in which the distinguishing features are both observed and recognized. Indiscriminate perception is important to the followers of the Advaita (Nondualist) school of Vedanta, for it allows for the

liberating perception of brahman (ultimate reality), which is without features.

ANUMAN INFERENCE

Because, many things we cannot see; we have to infer the situation and your inference should be valid. And how it will be valid? It is called inferences or anumana. Gautama, the propounder of the Nyaya system defines anumana as a 'knowledge which is preceded by perception.' Vatsyayana defines inference as the knowledge of an object through the previous knowledge of some sign or mark. Dr. B. N. Seal defines inference as "Anumana (inference) is the process of ascertaining, not by perception or direct observation, but through the instrumentality or medium of a mark, that a thing possesses a certain character."

UPMANA

Many times we gain knowledge by comparing from one to another; that means, you compare from one object to another and hence you gain the knowledge about that object. The term upamana has been translated in various ways as comparison, analogy, identification, knowledge by similarity or knowledge by assimilation, etc. It is the knowledge derived from comparison and generally corresponds to analogy. Upamana has been admitted mostly by the realist philosophers. Their theory of pramana (including upamana) mostly follows Bhatta Mimamsaka. In Indian Philosophical tradition, there are three major realist schools. They are Nyaya, Vaisesika and Mimamsa. Of these three

schools, the First and the third accept upamana as a distinct pramana while the Vaisesika realist does not admit upamana as a distinct source of valid cognition. Advaita also accepts it as a source of knowledge. According to the Nyaya, third kind of valid cognition is upamiti and its means is called upamana. Gautama defines comparison as the knowledge of a thing through it's similarity to another thing previously well known. Vacaspati Misra states that upamana is a distinct means of knowledge since it produces a distinct type of cognition. Comparison is the relation between the names and the objects denoted by them. Sabara has defined the results (pramiti), in the case of upamana, he choose to define the means is always clearly distinguished from the result.

SHABDA OR VERBAL TESTIMONY

It is a valid source of knowledge; that means, you know who is a reliable person on which context. Therefore, you ask him or her opinion, on a particular issue; whatever he or she will say to you, you have to accept that, and you proceed accordingly. And whatever knowledge you gain from that, is known as verbal testimony. It is the knowledge of objects derived from words or sentences. According to Nyaya philosophy, testimony is a reliable statement. A sentence is a group of words and word is a distinct entity which has the power to express some meaning. According to the ancient Nyaya system, this power of being is due to God, while according to the Nyaya philosophers it is endowed by

tradition. Sabda is also defined as the statement of an apta or a person who speaks and acts the way he thinks, a person whose mind, action and speech are in perfect harmony and is therefore accepted as an authority. It underlies the importance of Verbal testimony, providing authentic and authority of the relevant knowledge as the meaning of words and sentences (pada and vakya) which constitute verbal testimony. Vedanta Paribhasa states that a sentence is the unit of Sabda pramana which has been defined as a means of valid knowledge in which the relation among the meanings of its constituent word (which is the object of its intention) is not contradicted by any other means of knowledge. According to the Mimamsakas 'Sabda as pramana consists in the true knowledge of objects, derived from the understanding of the meaning of a sentence. According to Prabhakara non-Vedic Verbal cognition is of the nature of binference. Only the verbal cognition produced by the Vedas stands for Valid Verbal testimony but it is not in consistency with the theory of self validity of all cognitions. The Samkhya Karika defines verbal testimony as the statement (sruti) of the reliable (apta).

ARTHPATTI

The Advaita Vedanta and the Purva-Mimarhsa establish Arthapatti (Presumption or Postulation) to be a separate source of valid knowledge as different from Anumana (inference). According to the Naiyayikas, if we comprise Arthapatti within Anumana, it is

rather rendered into Anumana from circumstances or disjunctive hypothetical syllogism. While the Advaita Vedanta and both the Bhatta and Prabhakara Mimamsakas accept Arthapatti (presumption) as an independent source of valid knowledge and do not reduce to any other source ; the Naiyayikas, the Sāhkhya, the Buddhists and the others object to this view of Arthapatti as a separate means of valid knowledge. The word 'arthapatti' goes under various translation as presumption, postulation, supposition, implication and assumption. It is a process of assuming some unknown fact in order to account for a well-known fact which is otherwise inexplicable. Knowledge thus obtained is distinctive, since it is not to be reduce to Pratyaksha(perception) or Anumana (inference), and it is not of course, a case of Agama (verbal authority) or Upamana (comparison). 'Arthapatti' derivatively means imagination of something in a different way. When something is otherwise unintelligible, the assumption of what will make it intelligible is designed 'Arthapatti'. As for instance, 'there is rain when there are clouds' is known from the fact that there is no rain when there are no clouds . One may object that this Arthapatti is invalid because when clouds are present there is no rain. It is not acceptable. The argument in the objection runs from the observation of the coherence of lack of rain with lack of clouds to the conclusion that clouds are necessary but not sufficient condition for rain. The Naiyayikas refuse to acknowledge Arthapatti as a separate pramana. According to the Naiyayikas,

Arthapatti may be reduced to an Anumana (of the 'vyatireki' type).

ANUPALABDHI

In Vedanta Paribhasa, Dharmarajadhvarindra established the sixth way of valid knowledge which is accepted by the Advaita Vedantins as Anupalabdhi(non-apprehension) from the Vedantic stand point and as such very often deals with the refutation of other systems of philosophy like the Nyaya etc. In the Nyaya philosophy, Jayanta Bhatta refers only to the views of Bhattas, the Prabhakaras and Buddhists and comes to the conclusion that though Anupalabdhi or Abhava (Non-Apprehension or Negation) is a reality, Anupalabdhi is not a distinct way of knowing. The Advaita Vedantins accept Anupalabdhi as a distinct source of knowledge.

'In Indian Philosophy, Abhava (negation) has been discussed in two forms, viz., as an ontological reality and as a way of knowing. In the first form it is mentioned by such words as asat, alika, nirupakhya, nihsvabhava, etc., and in the second form it is referred to as Anupalabdhi. A general epistemological notion of the Bhatta Mimamsakas regarding negation is that there is some reality known as Abhava and there is a way ascertaining it which is known as Anupalabdhi. Here we are primarily concerned with the problem of Abhava as a means of knowledge'. The Advaita Vedantins and the Bhatta Mimamsakas accept Anupalabdhi(Non-Apprehension) as an independent source of knowledge. They hold the view that the absence of an object or its attribute from a locus

is known only through the means known as non-apprehension, i.e. 'anupalabdhi' but not by any other means of knowledge like Perception. The non-existence of a thing is apprehended by its non-perception. Non-apprehension of a thing is a means to the apprehension of its non-existence. In this context, the term non-apprehension stands for nonperception. Different theories of Anupalabdhi are found in oriental epistemology. Some systems deny Anupalabdhi as an additional pramana. There is a difference of opinion between the Naiyayika and the Vaisesika about the method of cognizing this pramana. The Naiyayikas maintain that Abhava is an object of perception (pratyaksa); on the other hand, in the opinion of the Vaisesikas it is cognized through inference(anumana). The Naiyayikas hold that non-existence of a pot on the ground is not identical with the bare ground.it is rather adjectival to it. Abhava is the character of the ground and it is perceived in the same ways in which the colour, size, etc., of the ground are perceived with the perception of the ground. To avoid these difficulties, the Naiyayikas have assumed special type of contact between the sence and Abhava which they call Visesana-visesya-bhava. The Naiyayikas who hold that Abhava is a reality but it can be cognized through perception and that there is no need of accepting Anupalabdhi as an additional pramana.

27. The Structure of Inference (Anumana)

From the definitions of inference mentioned above, it appears that an inference must have some constituents. It has three terms and at least three propositions. In the above mentioned example, three points are to be noted. First, there is the perception of a mark or reason (hetu), (e.g. smoke) in a subject (hill). Secondly, there is a recollection of the relation of invariable concomitance between smoke and fire as we have observed in the past. Thirdly, there is the inference of the existence of an unperceived object (e. g. fire) in the subject (e. g. hill). Three terms are involved in this inference. They are paka, sadhya and hetu. Paka is the subject in which the predicate or inferable object is doubted. The sadhya is that which we want to prove or establish in this inference. The hetu is the mark or sign which indicates the presence of the object which is to be inferred. Let us analyse the terms in the example mentioned above. Here in this example, hill is the paka, since paka is the subject in which the predicate is sought to be inferred. Smoke is the mark or sign which indicates the presence of the object which is to be inferred. Fire is the sadhya which is to be inferred in relation to the paka or the inferable. The paka, the sadhya and the hetu correspond to the minor term, major term and the middle term of the Aristotelian syllogism respectively. One point is to be added here the order of the propositions in a syllogism is written in the following way : the proposition which is sought to be established is to be written first, this is the conclusion

of the inference; then the reason for the conclusion is to be written and then the affirmation of the recollection between the sadhya and the madhya is to be written. Here the first is the conclusion, the second is the minor premise and the third is the major premise.

We have seen that in inference we must have at least three propositions, all of which are categorical and one must be affirmative and the others may be affirmative or negative. At this point we may observe that inference in Indian logic is a complex process which involves both induction and deduction. It includes both formal and material logic. But in western logic, a syllogism is formal. Moreover, a syllogism in western logic is generally stated in the form of three propositions, of which the first is the major premise, the second is the minor premise and the last is the conclusion.

In Nyaya theory of perception, we find five propositions. These propositions are known as 'members' (avayava) of Nyaya syllogism. These avayavas are: pratijña (proposition), hetu (reason), udaharana (example), upanaya (application) and nigamana (deduction). This five-member syllogism may be illustrated in the following way:

- 1) The hill is fiery (pratijña).
- 2) Because the hill is smoky(hetu).
- 3) Whatever is smoky is fiery, e.g. a kitchen(udaharana).

4) This hill is also smoky(upanaya).

5) Therefore this hill is fiery(nigamana).

The pratijña is the proposition which is sought to be established. The hetu is the second proposition which states the reason for this assertion. The third member is udaharana which states a universal relation between the hetu and the sadhya together with an example. The fourth is upanaya or the application of the universal concomitance to the present case. And the fifth is the nigamana or conclusion which is drawn from the preceding premises.

THE GROUNDS OF INFERENCE

Invariable concomitance or vyapti is the logical ground of inference. Udaharana or example which is the third proposition of the Nyaya system is regarded to be the logical ground of inference. Vyapti is the nerve of inference. Now the question is— what is vyapti? How is vyapti known by us?

Vyapti

Inference is the second source of valid knowledge according to nyaya philosophy. Anumana is the ground of inferential knowledge. According to naiyayikas, there are two grounds for an inferential knowledge. One is logical ground, another is psychological ground. A logical ground for inference is vyapti relation. Vyapti relation is a universal concomitant and invariable relation between hetu or linga (middle term) and sadhya (major

term) and in any kind of inference that can be found indispensably. Therefore, vyapti relation plays an important role in case of an inference. By the help of vyapti relation, we establish sadhya in pakshya. Sadhya is a major term and pakshya is a minor term. Vyapti are of two types, one is samavyapti and another is asamavyapti.

Samavyapti

Samavyapti means two sided relation. That means by seeing a smoke, you can infer fire and by seeing a fire, you can also infer smoke. So, therefore, while inferring by seeing one to another, you can also inversely infer the situation, then that is called samavyapti.

In case of samavyapti, it is said that if you know that what is the effect, you know that where it comes from. That means, if you know the curd, you know that certainly it comes from milk and if you know that milk you know that after such and such condition it will transform to the curd. So, in both sides you can find the relation.

In case of samavyapti, naiyayikas said that it is an equipollent concomitance relation between the two terms hetu and sadhya. That means these two terms hetu and sadhya, should be invariably related in such a manner that if one can see perceive one thing, immediately one can infer other things. For example, if one can see there is a smoke in one side, immediately one can infer fire and if one see the fire, one can immediately infer the

smoke because they have a concomitance and invariable inseparable and universally related with each other, it means hetu can't exist without sadhya and vice-versa. So in samavyapti we may infer the cause from the effect and substance from the attribute and vice versa.

Asamavyapti

Asamavyapti is also known as Visamvyapti that means we can only infer from one to another side but inversely we cannot do so.

Asamavyapti means only one side we can infer it, not in reverse way. For example "all men are mortal", cannot say that all mortals are men because there are many animals, reptiles, insects also with mortality, they have the mortality. Naiyayikas explained here is that in this case, in case of asamavyapti we can argue only from one side. It is a relation of non-equipollent concomitance between the two terms. It is not a co-extensive because we may infer from one to another but not inversely. It corresponds to the western logic universal affirmative (A-type) propositions only because in case of universal affirmative proposition, only the subject part is distributed.

Vyapti relation can be explained both positively and negatively. For example, if I say this is my book. According to naiyayikas, they say that this book is not phone, this book is not pen, this book is not tree etc.

Hetu and sadhya is based on the four factors. One is anvaya, the second one is vyatireka, the third one is phuyodarsana and fourth one is tarka.

The **anvaya** is an affirmative inference. This is based on universal affirmative proposition (A). It is a permanent relation between this hetu and sadhya. We perceive these two things together always. In anvaya “all M is P”. M here stands for as a middle term and P stands for the major term. In reference to the nyaya logicians, you find M is a middle term stands for hetu and P as a major term stands for sadhya.

Vyatireka contrasts to anvaya. This is based on universal negative proposition. This negatively establishes some fact. It contradicts to anvaya. The process of contradicting means the subject of the anvaya will be placed in the predicate of the vyatireka in a contradiction form and also the predicate of the anvaya contradicts and placed in the subject form of vyatireka. So, that in this case we will get “all not P is not M” because the P here the subject part which is neglected here in vyatireka.

Phuyodarsana implies the repeated observation of two terms together. We can infer only when in our past we have observed many of the situations positively.

Tarka, which stands for a hypothetical reasoning or hypothetical argument. Tarka or the hypothetical argument or hypothetical reasoning is needed for proving the validity of arguments. It helps or assists for removing the doubt of the argument of the fact.

Naiyayikas said that this tarka or the hypothetical argument helps for removing the doubts of the argument or the fact. Further they say wherever there is a doubt; it is arrested by tarka or hypothetical argument. If something is wrong in the conclusion, we may say that the argument may not be following proper logically or sequence. If there is no vyapti relation as such, then the fallacy will arise known as petitio principii.

HETAVABHASAS (FALLACIES)

In Indian logic a fallacy is known as hetvabhasa. This fallacy means, the middle term appears to be a reason but is not a valid reason. In Western logic fallacies are formal in nature. But the Naiyayikas hold that the logical forms of inference are the same for all valid inferences. A fallacy relates to material condition of an inference. So all fallacies are material fallacies. There are five characteristics of a valid term. When these characteristics are violated, fallacies arise.

Five characteristics of a middle term are:

- (1) It must be present in the minor term (pakadharmata); e.g., smoke must be present in the hill.
- (2) It must be present in positive instances in which the major term is present;; e.g., smoke must be present in the kitchen where fire exists (sapakasattva).

(3) It must be absent in all negative instances in which the major term is absent; smoke must be absent in the lake in which fire does not exist (vipakasattva).

(4) It must be non-incompatible with the major term; e. g., it must not prove the coolness of fire (abadhita).

(5) It must be qualified by the absence of counteracting reasons which lead to a contradictory conclusion; e.g., ‘the fact of being caused’ should not be used to prove the ‘eternality’ of sound. (aviruddha). Violation of the above characteristics leads to the following fallacies.

- 1) Savyabhichara,
- 2) Viruddha,
- 3) Satpratipaka,
- 4) Asiddha, and
- 5) Badhita.

(1) Savyabhichara or the fallacy of irregular middle: A middle term may be irregularly related to the major term. When the middle is not uniformly related to the major term then that is called savyabhichara hetu. Let us take the following example,

All bipeds are rational. Swans are bipeds. Therefore, swans are rational.

Here, the middle term is ‘biped’. But it is not uniformly related to the major term ‘rational’. The middle term in this example may be

related to both rational and non-rational creatures. Therefore, it is a defective hetu.

(2) **Viruddha** or the contradictory middle: The viruddha hetu or the contradictory middle is that hetu, which though offered to establish the existence of the sadhya actually establishes the non-existence of the sadhya; e.g. 'sound is eternal, because it is produced'- here, the middle term 'produced' does not prove the eternality of sound, but proves its non-eternality. Here, the middle term itself disproves the original proposition and proves its contradictory

(3) **Satpratipaka** or the inferentially contradicted middle: When a hetu which is advanced to establish a particular sadhya in an inference is validly contradicted by another hetu which proves the non-existence of the sadhya of the first inference, the fallacy of satpratipaka arises. In this case the first hetu is called satpratipaka hetu. For example, 'sound is eternal, because it is audible' is validly contradicted by another inference 'sound is non-eternal, because it is produced like a pot.' Here, the middle term of the first inference, 'audible' is contradicted by the middle term of the second inference 'produced.'

(4) **Asiddha** or the unproved middle: The asiddha hetu is one which is not yet proved, but requires to be proved, like the sadhya. This means that the asiddha hetu is not a proved or an established fact, but an asiddha or unproved assumption. Let us take an example, 'skylotus is fragrant, because it has lotusness in it

like a natural lotus'. The middle term of the argument is yet to be proved, because we are yet to establish the existence of skylotus.

(5) Badhita hetu or the non-inferentially contradicted middle :The middle term of an inference may be contradicted by some other 'stronger' means of knowing, such as perception, testimony etc. It cannot prove the major term which is disproved by another stronger source of valid knowledge, e. g.,

'fire is cold, because it is a substance'. Here the middle term 'substance' becomes contradicted because its major term 'coldness' is directly contradicted by perception. These are the five kinds of defective hetus recognized in Indian logic.

Though a fallacy has no direct bearing upon inference as it is not a constitutive factor of it, it cannot be left aside as irrelevant.

Fallacy is an impediment which must be avoided in order that the premises can lead to the expected conclusion. Fallacy has been defined to be a defect of the probans which being detected presents the deduction of the conclusion. Though the fallacy is not the condition of inference, the absence of it is so. It acts as a thwarting agent and if the probans be affected by it, the knowledge of the premises will be ineffective. It is therefore essential that an arguer should avoid the fallacies in order to make his argument successful and effective. It is therefore the negative condition of inference. The study of fallacies therefore is not useless inasmuch as it enables the arguer to achieve his objective. This is the positive service which is rendered by the

knowledge of fallacies, which can be eliminated only if the arguer has knowledge of them in their general as well as their specific characters. The knowledge of fallacy also acts as a successful instrument for the exposure of the defects in the argument of the opponent. It thus brings to an end the debate by proving the opponent to be in the wrong and thereby rendering the syllogistic argument employed by him drop like a damp squib.

Fallacy arises when there is a deficiency in the requisite character of anyone of the factors of inference which being discovered shows that either the major premises or the minor premises is wrongly formulated. The logicians of the Nyaya School regard contradiction.