

★ UGC NET / SET / JRF 2026 CRACKER SERIES

LOGICAL REASONING & INDIAN LOGIC (UNIT 6)

Complete Conceptual & Exam Blueprint — Categorical Propositions, Square of Opposition, Syllogisms, Moods & Figures, Fallacies, Pramanas, Vyapti, and Hetvabhasa.



Arguments, Moods & Figures



Square of Opposition & Venn
Diagrams



6 Pramanas & Nyaya
Epistemology



Formal & Informal Fallacies +
Hetvabhasa

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MODULE 01: STRUCTURE OF ARGUMENTS & CATEGORICAL PROPOSITIONS



Figure 1.1: In logic as in chess, every conclusion must be strictly warranted by valid premises and rules of inference.

4

Categorical Types (A, E, I, O)

3

Constituent Terms (S, P, M)

2

Qualities
(Affirmative/Negative)

2

Quantities
(Universal/Particular)

1.1 What is an Argument?

An **Argument** is a set of declarative statements (propositions) in which one statement is claimed to follow from the others. It consists of:

- **Premises:** The supporting evidence, reasons, or assumptions (indicators: *Since, Because, For, Given that, As indicated by*).
- **Conclusion:** The statement being established or inferred (indicators: *Therefore, Hence, Thus, So, Consequently, It proves that*).

1.2 Categorical Propositions (Standard Form)

A categorical proposition asserts or denies that all or some members of one category (Subject term S) are included in another category (Predicate term P). Every standard form has four parts: **Quantifier + Subject term + Copula + Predicate term**.

Type	Standard Form	Quantity	Quality	Distribution of Terms
A	All S are P	Universal	Affirmative	Subject: Distributed Predicate: Undistributed
E	No S are P	Universal	Negative	Subject: Distributed Predicate: Distributed
I	Some S are P	Particular	Affirmative	Subject: Undistributed Predicate: Undistributed
O	Some S are not P	Particular	Negative	Subject: Undistributed Predicate: Distributed

🧠 SUPER MNEMONIC — TERM DISTRIBUTION: "ASEBOP" / "UN-DISTRIBUTE"

A distributes **S**ubject only.

E distributes **B**oth (Subject & Predicate).

I distributes **N**one (Neither Subject nor Predicate).

O distributes **P**redicate only.

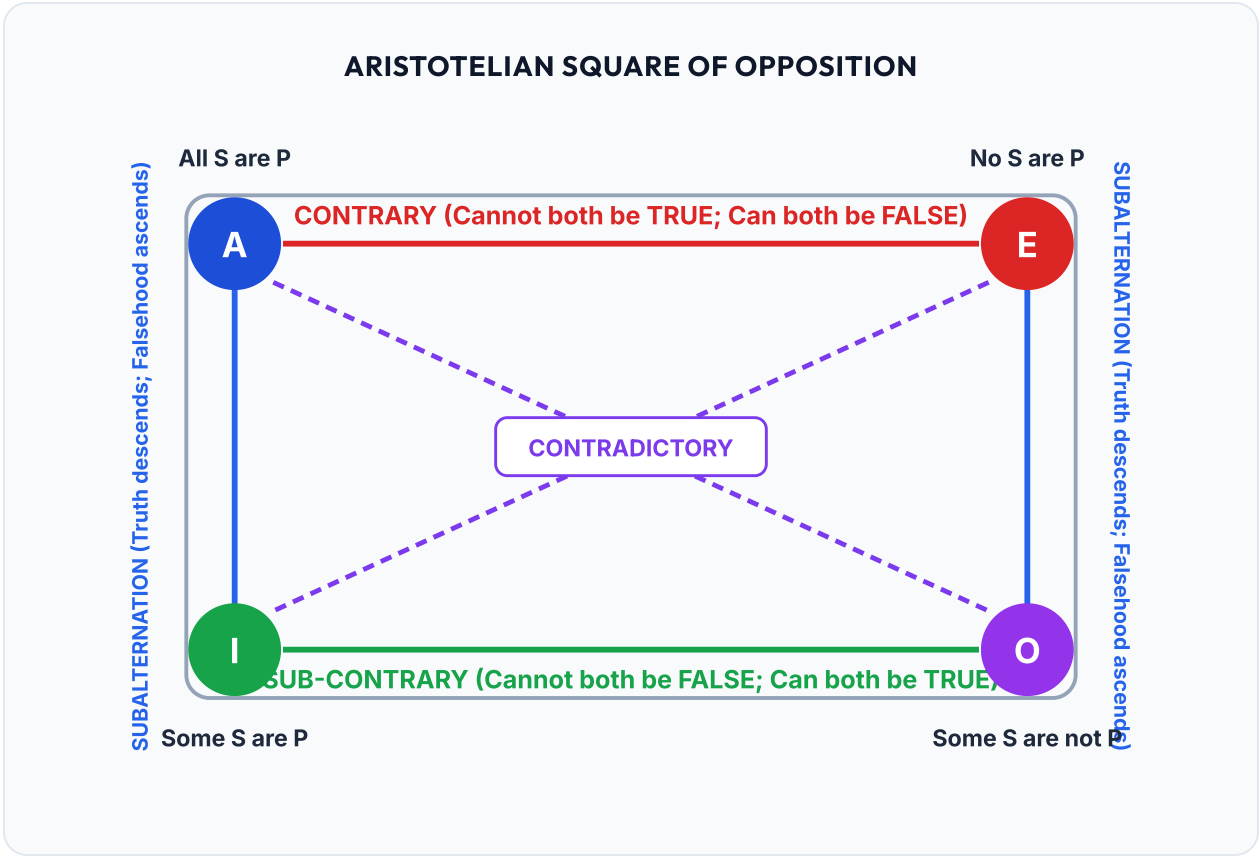
Short formula: **A=S, E=Both, I=None, O=P**.

🔥 PYQ ALERT: NON-STANDARD CONVERSIONS TO STANDARD FORM

- "Every human is mortal" : **All** humans are mortal (**A** type).
- "Only graduates are eligible" : **All** eligible candidates are graduates (**A** type — "Only S are P" reverses to "All P are S").
- "Almost all students passed" : **Some** students passed (**I** type).
- "Few teachers attended" / "Hardly any" : **Some** teachers are **not** attendees (**O** type — negative connotation!).
- "None but the brave deserve the fair" : **All** who deserve the fair are brave (**A** type).

MODULE 02: CLASSICAL SQUARE OF OPPOSITION

The **Square of Opposition** illustrates the four distinct logical relationships between the four categorical propositions (A, E, I, O) that share the **exact same Subject and Predicate terms**.



2.1 The 4 Classical Opposition Relations (Strict Rules)

Relation	Pairs	Truth-Value Golden Rule	Exam Inference Formula
Contradictory	A – O E – I	Always exact opposites . If one is TRUE, the other is strictly FALSE. If one is FALSE, the other is strictly TRUE.	If A is True, then O is False If I is False, then E is True

Relation	Pairs	Truth-Value Golden Rule	Exam Inference Formula
Contrary	A – E	Both cannot be TRUE together, but both CAN be FALSE at the same time.	If A is True, then E is False <i>If A is False, then E is Undetermined.</i>
Sub-Contrary	I – O	Both cannot be FALSE together, but both CAN be TRUE at the same time.	If I is False, then O is True <i>If I is True, then O is Undetermined.</i>
Subalternation	A to I E to O	Truth flows DOWNWARD (from Universal to Particular). Falsehood flows UPWARD (from Particular to Universal).	If A is True, then I is True If I is False, then A is False

MOHIT SIR'S 5-SECOND SQUARE SHORTCUT MATRIX

1. If **Universal is TRUE**, then the Particular below it is strictly **TRUE** (A to I, E to O).
2. If **Particular is FALSE**, then the Universal above it is strictly **FALSE** (I to A, O to E).
3. If **Universal is FALSE**, then the subaltern particular is **DOUBTFUL / UNDETERMINED**.
4. If **Particular is TRUE**, then the superaltern universal is **DOUBTFUL / UNDETERMINED**.

MODULE 03: CATEGORICAL SYLLOGISMS, MOODS & FIGURES

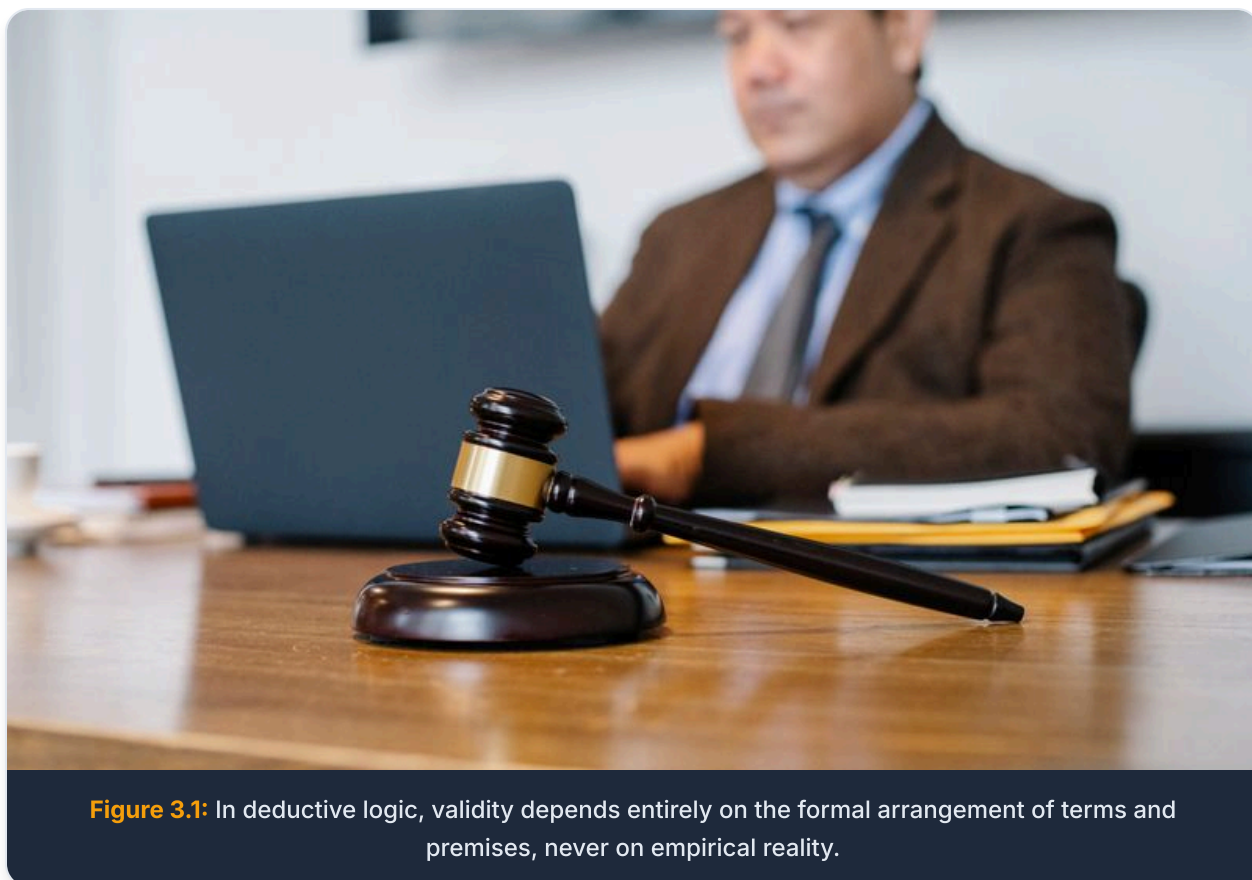


Figure 3.1: In deductive logic, validity depends entirely on the formal arrangement of terms and premises, never on empirical reality.

3.1 Structure of a Categorical Syllogism

A **Standard-form Categorical Syllogism** is an argument with exactly **two premises**, **one conclusion**, and exactly **three distinct terms**, each occurring twice in different propositions.

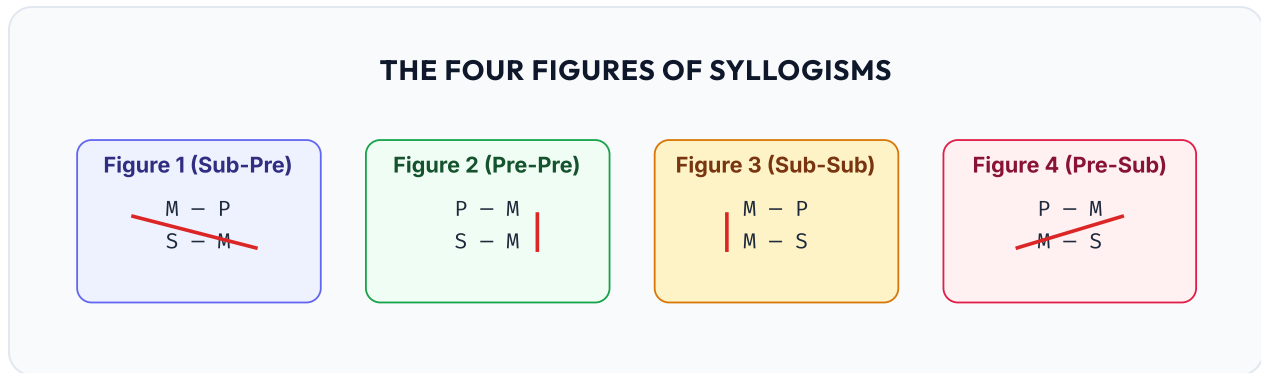
📌 THE THREE INDISPENSABLE TERMS

- **Major Term (P):** The *Predicate* of the conclusion.
- **Minor Term (S):** The *Subject* of the conclusion.
- **Middle Term (M):** Occurs in **both premises**, but **NEVER in the conclusion**. It serves as the logical bridge.

- **Major Premise:** The premise containing the Major Term (P). Listed **FIRST**.
- **Minor Premise:** The premise containing the Minor Term (S). Listed **SECOND**.

3.2 The Four Syllogistic Figures

The **Figure** of a syllogism is determined exclusively by the position of the Middle Term (M) in the two premises:



3.3 Mood of a Syllogism

The **Mood** is the three-letter sequence representing the types of propositions in order: **Major Premise + Minor Premise + Conclusion**.

Example: If Major Premise is **A**, Minor Premise is **A**, and Conclusion is **A**, the Mood is **AAA**. Combined with Figure 1, the full identification is **AAA-1 (Barbara)**.

MATH BEHIND MOODS & FIGURES

- Total possible Moods = $4 \times 4 \times 4 = 64$ combinations.
- Across 4 Figures = $64 \times 4 = 256$ standard syllogistic forms.
- Out of 256 forms, only **15 are unconditionally valid** in modern Boolean logic (and **24 conditionally valid** in traditional Aristotelian logic allowing existential import).

3.4 Six Inviolable Rules of Syllogistic Validity

#	Rule of Validity	Fallacy Committed if Broken
1	A valid syllogism must contain exactly three terms used in the same sense.	Fallacy of Four Terms (Quaternio Terminorum)
2	The Middle Term must be distributed at least once in the premises.	Fallacy of Undistributed Middle
3	If a term is distributed in conclusion, it MUST be distributed in premise .	Illicit Major (if Major term) or Illicit Minor (if Minor term)

#	Rule of Validity	Fallacy Committed if Broken
4	Two negative premises yield NO valid conclusion.	Fallacy of Exclusive Premises
5	If either premise is negative, conclusion MUST be negative (and vice versa).	Fallacy of Drawing an Affirmative Conclusion from a Negative Premise
6	From two universal premises , a particular conclusion cannot be drawn (Boolean logic).	Existential Fallacy

MODULE 04: DEDUCTIVE VS INDUCTIVE REASONING & ANALOGIES



Figure 4.1: Deductive reasoning moves with logical necessity from general laws to specific instances; Inductive reasoning infers probable general principles from specific observations.

4.1 Deductive vs Inductive Reasoning (Key Distinctions)

Feature	Deductive Reasoning	Inductive Reasoning
Direction of Thought	General to Particular (Top-Down)	Particular to General (Bottom-Up)
Certainty of Conclusion	100% Necessary / Absolute	Probable / Likelihood (Never absolute)
Evaluation Metrics	Valid / Invalid & Sound / Unsound	Strong / Weak & Cogent / Uncogent

Feature	Deductive Reasoning	Inductive Reasoning
Information Content	Conclusion contains <i>no new information</i> beyond premises.	Conclusion goes <i>beyond premises</i> (ampliative).
Effect of Additional Evidence	Cannot alter validity of a valid argument.	New evidence can strengthen or weaken the conclusion.

📌 SOUNDNESS VS VALIDITY (CLASSIC EXAM CONFUSION)

- **Validity:** Relates strictly to logical *structure*. An argument is valid if it is impossible for premises to be true and conclusion false simultaneously.
- **Truth:** Pertains to individual statements/premises matching real-world facts.
- **Sound Argument:** An argument that is **Valid + All premises are FACTUALLY TRUE**.
- **Takeaway:** An argument can be completely **Valid** even if its premises are blatantly false! (e.g., *All elephants have wings; All winged creatures fly; therefore, All elephants fly* — this is **Valid, but Unsound!**).

4.2 Analogical Reasoning

An **Argument from Analogy** infers that because two things are alike in several known respects (A, B, C), they will also be alike in another further respect (D).

⚖️ CRITERIA FOR EVALUATING STRENGTH OF ANALOGICAL ARGUMENTS

1. **Number of entities:** More observed instances with the resemblance increase strength.
2. **Number of respecting respects:** More shared relevant properties increase probability.
3. **Relevance of similarities:** Shared features must be causally or materially linked to conclusion.
4. **Disanalogies (Differences):** Crucial dissimilarities severely weaken the analogy.
5. **Modesty of Conclusion:** A cautious conclusion is stronger than a bold, sweeping assertion.

MODULE 05: VENN DIAGRAMS & USES OF LANGUAGE



Fig 5.1: Symbolic representation and diagrammatic proofs ensure mathematical rigor in logic.

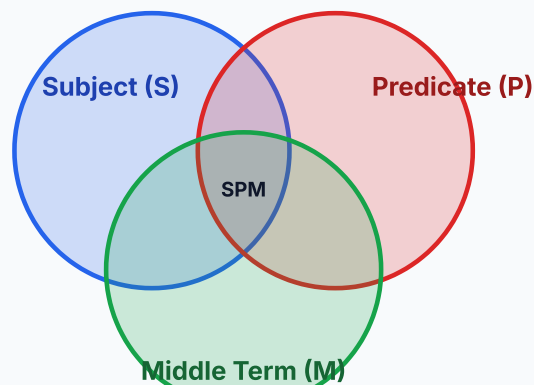


Fig 5.2: Language serves informative, expressive, and directive functions in philosophical discourse.

5.1 Venn Diagram Method for Syllogism Validity

Developed by **John Venn (1880)**, Venn diagrams represent categorical propositions using intersecting circles. For a three-term categorical syllogism, three overlapping circles represent S, P, and M.

THREE-CIRCLE VENN DIAGRAM FOR SYLLOGISMS



Test of Validity: Diagram ONLY the two premises. If the conclusion is automatically depicted without drawing anything new, the syllogism is **VALID**. If not, it is **INVALID**.

5.2 Connotation and Denotation of Terms

Dimension	Connotation (Intension)	Denotation (Extension)
Definition	The set of essential attributes, qualities, or traits shared by all objects to which the term applies.	The collection of all real physical objects or individuals that the term correctly names.
Example ("Philosopher")	Rational, reflective, seeker of truth and wisdom.	Socrates, Plato, Aristotle, Shankara, Nagarjuna, Kant...
Law of Inverse Variation	As connotation increases (more specific traits added), denotation decreases (fewer members fit).	As denotation increases , connotation decreases .

INVERSE VARIATION EXAMPLE (PYQ FAVORITE)

1. *Animal* : Highest Denotation, Lowest Connotation.
2. *Mammal* : More attributes, fewer animals.
3. *Canine* : Even more attributes, fewer members.
4. *Dog* : Specific traits.
5. *Golden Retriever* : **Highest Connotation, Lowest Denotation.**

MODULE 06: FORMAL & INFORMAL FALLACIES



Fig 6.1: A fallacy is a defect in an argument that impairs its validity or cogency.



Fig 6.2: In debates, informal fallacies misdirect attention through emotion or misrepresentation.

6.1 Formal Fallacies (Errors in Logical Form)

Formal Fallacy	Pattern / Structure	Example
Affirming the Consequent	If P, then Q. Q. Therefore, P.	<i>If it rains, roads are wet.</i> <i>Roads are wet.</i> <i>therefore, It rained.</i> (Invalid! Water tanker could cause it).
Denying the Antecedent	If P, then Q. Not P. Therefore, Not Q.	<i>If you are a cricketer, you are an athlete.</i> <i>You are not a cricketer.</i> <i>therefore, You are not an athlete.</i> (Invalid!).
Undistributed Middle	All P are M. All S are M. Therefore, All S are P.	<i>All dogs are mammals. All cats are mammals.</i> <i>therefore, All cats are dogs.</i>

6.2 Informal Fallacies (Errors in Content & Context)

1. **Argumentum ad Hominem (Attack on Person):** Rejecting an argument by attacking the opponent's background, character, or motive instead of their reasoning. (e.g., *"You cannot trust his economic policy because he didn't finish college!"*).
2. **Straw Man Fallacy:** Distorting, exaggerating, or misrepresenting an opponent's argument to make it easy to demolish.
3. **Appeal to Inappropriate Authority (Ad Verecundiam):** Citing a famous personality outside their area of expertise (e.g., *"A film star endorses this medicine, so it must cure asthma!"*).
4. **Appeal to Ignorance (Ad Ignorantiam):** Arguing that a proposition is true simply because it has not been proven false (or vice versa). (e.g., *"No one has proven ghosts don't exist, therefore they do."*).
5. **Appeal to Emotion / Pity (Ad Misericordiam):** Exploiting pity or emotional sorrow to force agreement rather than offering proof.
6. **Appeal to Popularity (Ad Populum / Bandwagon):** Arguing a claim is true just because the majority believes it.
7. **Begging the Question (Petitio Principii / Circular Reasoning):** Assuming the truth of the conclusion within the premises themselves. (e.g., *"God exists because the Holy Book says so, and the Holy Book is true because God wrote it."*).
8. **Slippery Slope:** Claiming without evidence that an initial harmless step will inevitably trigger a disastrous chain reaction of events.
9. **Fallacy of Composition:** Erroneously attributing a property of the individual parts to the whole entity. (e.g., *"Every player in this team is world-class, therefore this team is invincible."*).
10. **Fallacy of Division:** Erroneously assuming what is true of the whole must be true of every individual part. (e.g., *"This company is wealthy, so every employee here must be wealthy."*).

MODULE 07: INDIAN LOGIC — PRAMANAS (MEANS OF KNOWLEDGE)



Figure 7.1: The Six Pramanas in Indian Epistemology — Pratyaksha, Anumana, Upamana, Shabda, Arthapatti, and Anupalabधि.

7.1 Epistemological Framework of Indian Philosophy

In Indian philosophy, **Prama** means valid knowledge; **Aprama** means invalid knowledge; **Pramana** is the valid source or instrument of knowledge; **Pramata** is the knower; and **Prameya** is the object of knowledge.

7.2 The 6 Classical Pramanas Detailed

Pramana	English Term	Definition & Mechanism	Classic Example
1. Pratyaksha	Perception	Direct cognition arising from contact of sense organs	Seeing a blue lotus or hearing a temple bell

Pramana	English Term	Definition & Mechanism	Classic Example
		(<i>Indriyas</i>) with objects (<i>Artha</i>). • <i>Nirvikalpaka</i> (Indeterminate / raw) • <i>Savikalpaka</i> (Determinate / recognized with name & attributes)	directly.
2. Anumana	Inference	Knowledge derived after perception based on invariant relation (<i>Vyapti</i>) between a mark (<i>Hetu</i>) and the unperceived fact (<i>Sadhya</i>).	<i>"The hill has fire because it has smoke, like a kitchen."</i>
3. Upamana	Comparison / Analogy	Knowledge of the relation between a word and the object denoted by it through similarity with a previously known object.	Recognizing a wild cow (<i>Gavaya</i>) in the forest based on an elder's description: <i>"A Gavaya resembles a domestic cow."</i>
4. Shabda	Verbal Testimony	Statement of a trustworthy expert (<i>Aptavakya</i>) who knows the truth and communicates it correctly. • <i>Vaidika</i> (Scriptural / infallible) • <i>Laukika</i> (Secular / human speech)	Directions from a reliable doctor; scientific encyclopedias.
5. Arthapatti	Implication / Postulation	Supposition of an unperceived fact to resolve an apparent contradiction between two known facts.	<i>"Devadatta is fat, yet he does not eat during the day."</i> Hence, we postulate that he eats at night!
6. Anupalabdhi	Non-Apprehension	Perception of the non-existence (<i>Abhava</i>) of an object where it would have been perceived if present.	<i>"There is no jar on this table"</i> — we perceive the absence of the jar directly.

7.3 Schools of Indian Philosophy & Their Accepted Pramanas



NTA PYQ MASTER TABLE — PRAMANAS ACCEPTED BY DIFFERENT SCHOOLS

School of Philosophy	Number	Accepted Pramanas
Charvaka (Materialist)	1	Pratyaksha only
Buddhism & Vaisheshika	2	Pratyaksha, Anumana
Sankhya & Yoga	3	Pratyaksha, Anumana, Shabda
Nyaya (Gautama)	4	Pratyaksha, Anumana, Upamana, Shabda
Prabhakara Mimamsa	5	Pratyaksha, Anumana, Upamana, Shabda, Arthapatti
Advaita Vedanta & Bhatta Mimamsa	6	All 6 Pramanas (Pratyaksha, Anumana, Upamana, Shabda, Arthapatti, Anupalabdhi)

MODULE 08: STRUCTURE OF ANUMANA, VYAPTI & HETVABHASA

8.1 Terms of Anumana (Nyaya Syllogism)

Sanskrit Term	Western Logic Equivalent	Role in Inference	Example ("Hill has fire because of smoke")
Paksha	Minor Term	The subject / location where the inference is made	The Hill (<i>Parvata</i>)
Sadhya	Major Term	The object of inference / property to be established	Fire (<i>Agni</i>)
Hetu / Linga / Sadhana	Middle Term	The ground, sign, mark, or reason that indicates Sadhya	Smoke (<i>Dhuma</i>)

8.2 The 5-Member Nyaya Syllogism (Pancavayava)

Unlike the Western Aristotelian syllogism (3 propositions), the Nyaya school specifies a **5-step structured syllogism** for proving an inference to others (*Pararthanumana*):

THE 5 STEPS OF NYAYA SYLLOGISM (PANCAVAYAVA)

Step	Sanskrit Name	Significance	Standard Formula Example
1	Pratijna	Proposition to be proved	<i>The hill has fire.</i>
2	Hetu	Reason / Ground for statement	<i>Because it has smoke.</i>
3	Udaharana	Universal relation with universal Example	<i>Wherever there is smoke, there is fire, as in a kitchen hearth.</i>

Step	Sanskrit Name	Significance	Standard Formula Example
4	Upanaya	Application of universal relation to the case	<i>This hill has smoke, which is invariably associated with fire.</i>
5	Nigamana	Conclusion proved	<i>Therefore, this hill has fire.</i>

 **MNEMONIC: "PHUUN"**
Pratijna — Hetu — Udaharana — Upanaya — Nigamana.

8.3 What is Vyapti?

Vyapti is the invariable, unconditional, and universal concomitance between the Hetu (middle term) and Sadhya (major term). Without Vyapti, no inference is possible.

- **Vyapya:** The pervaded term (e.g., Smoke).
- **Vyapaka:** The pervading term (e.g., Fire).
- *Anupadhika Sambandha:* A relation free from all adventitious conditions (Upadhis).

8.4 Hetvabhasa (Fallacies of Inference)

In Nyaya logic, **Hetvabhasa** literally means "a semblance of reason" — a middle term that appears valid but is defective. Nyaya classifies 5 primary forms:

Hetvabhasa	Nature of Defect	English Translation	Classic Exam Example
1. Savyabhichara	Irregular / inconstant middle term; Hetu exists where Sadhya is absent.	Fallacy of Irregular Middle	<i>"All bipeds are rational; Swans are bipeds; therefore, Swans are rational."</i>
2. Viruddha	Contradictory middle term; Hetu disproves the very Sadhya it seeks to prove.	Fallacy of Contradictory Middle	<i>"Sound is eternal, because it is produced."</i> (Produced things are non-eternal!).
3. Satpratipaksha	Counterbalanced middle term; An equally strong counter-reason exists to prove the opposite.	Fallacy of Counterbalanced Reason	<i>"Sound is eternal because it is audible"</i> countered by <i>"Sound is non-</i>

Hetvabhasa	Nature of Defect	English Translation	Classic Exam Example
			<i>eternal because it is an effect."</i>
4. Asiddha (Sadhyasama)	Unproved / non-existent middle term. • <i>Ashrayasiddha</i>: Substratum is fictitious (e.g., "Sky-lotus has fragrance"). • <i>Svarupasiddha</i>: Hetu cannot exist in Paksha. • <i>Vyapyatvasiddha</i>: Concomitance is conditional/unproved.	Fallacy of Unproved Middle	<i>"Sky-lotus is fragrant because it is a lotus." (Sky-lotus does not exist!).</i>
5. Badhita	Contradicted by another stronger Pramana (e.g., direct perception).	Fallacy of Non-Inferentially Contradicted Middle	<i>"Fire is cold, because it is a substance." (Direct touch proves fire is hot, nullifying inference!).</i>

MODULE 09: QUICK REVISION – ONE-LINERS & HIGH-YIELD PYQ CARDS

⚡ RAPID-FIRE FORMULAS FOR EXAM MORNING

- **Contradictories:** A and O are opposites; E and I are opposites. Truth of one guarantees falsehood of other.
- **Contraries (A & E):** Cannot both be True; Can both be False.
- **Sub-contraries (I & O):** Cannot both be False; Can both be True.
- **Subalternation:** Truth runs downward (A to I, E to O); Falsehood runs upward (I to A, O to E).
- **Distributed Terms:** **A** distributes Subject; **E** distributes Both; **I** distributes Neither; **O** distributes Predicate.
- **Deductive Validity:** Truth of premises logically guarantees truth of conclusion.
- **Syllogism Terms:** Major term = Predicate of conclusion; Minor term = Subject of conclusion; Middle term = appears in both premises, never in conclusion.
- **Arthapatti vs Anumana:** Arthapatti is accepted as independent only by Mimamsa and Advaita; Nyaya subsumes it under Anumana.
- **Anupalabdhi:** Distinct means to apprehend *Abhava* (absence). Accepted as independent by Kumarila Bhatta and Shankaracharya.
- **Vyapti:** Universal, unconditional concomitance between Hetu and Sadhya.
- **Badhita:** When the middle term is contradicted by direct perception (e.g., "Fire is cold").
- **Viruddha:** The middle term proves the exact contradictory of what it was supposed to prove.

🔥 TOP 5 REPEATED ASSERTION & REASONING PATTERNS

Pattern 1: "If 'All men are honest' is TRUE, what is the status of 'Some men are not honest'?"

Answer: Strictly FALSE (Contradictory relationship A and O).

Pattern 2: "If 'Some flowers are red' is FALSE, what is the status of 'Some flowers are not red'?"

Answer: Strictly TRUE (Sub-contrary relationship I and O cannot both be false).

Pattern 3: *"Fat Devadatta does not eat food during the day, yet he continues to grow fatter."*

Answer: Arthapatti (Implication / Postulation).

Pattern 4: *"The hill has fire because it has smoke" — here the Hill is?*

Answer: Paksha (Minor term).

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