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2.1 Sentence

A sentence is a group of words conveying a complete thought, consisting of a subject—what is being spoken about—and a predicate—what is said about the subject.

Meaning of sentence: A combination of words that makes complete sense is called a sentence. The sense is not complete, unless **something is said about something else**. An English sentence is composed of subject and predicate. [Nesfield 2011 p 1-2]

Subject: The word or words denoting the person or thing about which something is said are called the subject of the sentence. For example, "A ship" is a subject in the following sentence.

> **A ship** went out to sea.

Predicate: The word or words which say something about the person or thing denoted by the subject are called the predicate. For example, "went out to sea" is predicate in the following sentence.

> A ship **went out to sea.**

2.2 Type of sentence

There are four different kinds of sentences: Statements, Desires, Questions, and Exclamations.

Statements are those sentences which simply **affirms** or **deny** something. Eg:

> A man's success depends chiefly on himself. (Affirmative sentence)
>
> He did not get much help from others. (Negative sentence)

Desires are those sentences which contain some command, request, entreaty, or wish. Eg:

Rely chiefly on your own effort. (**Command**)

Lend me a pen. (**Request**)

Save me. (**Entreaty**)

God save the Queen! (**Wish**)

Questions are those sentences which inquire about something. It may be objective (seeking reply in yes or no) or subjective (seeking an elaborate reply). Eg:

Have you finished your work? (**Objective question**)

Where are you going? (**Subjective question**)

Exclamations are those sentences which express sudden feeling, such as pleasure, anger or surprise, about something which has been said or done. Eg:

How wonderful! (**Pleasure**)

What a shame! (**Anger**)

What a piece of luck! (**Surprise**)

2.3 Proposition

A proposition is a statement that affirms or denies something, forming a unit of reasoning composed of a subject, predicate, and copula; it may be affirmative, negative, conditional, or compound, with compound propositions further classed as conjunctive ("and"), disjunctive ("either/or" inclusive), or alternative ("either/or" exclusive).

Meaning of Proposition: A proposition is a **statement** which **asserts** something; and is a unit of reasoning. [*Copi 2012 p 1-2*]

Here, statement is a kind of sentence; asserts implies either affirms or denies. For example,

All men are mortal.

A question asserts nothing ie it neither affirms nor denies a thing. Similarly, neither a desire nor an exclamation is a proposition.

Structure of a proposition: Proposition in its simplest form have three constituents viz. subject, predicate and copula. [CBSE Philosophy XI 2011 p 60]

Subject of a proposition is that about which something is said.

Predicate of a proposition states something about the subject.

Copula: Between the subject and the predicate occurs a verb generally in 'to be' form. The verb serves to connect the subject and the predicate and is called 'copula'. If there is no copula, there is no connecting link between the subject and the predicate, and consequently there is no proposition. For example, 'are' is the copula in the following sentence.

'All men **are** mortal.'

Affirmative and negative proposition: A proposition may be affirmative or negative based on the assignment or denial of the predicate to the subject. A proposition is **affirmative** when predicate is assigned to subject. Eg:

'Narendra Modi **is** the Prime Minster of India.'

A proposition is **negative** when predicate is denied to subject. Eg:

'Mumbai **is not** the capital of India.'

Conditional proposition: A conditional proposition is that in which a predicate is assigned or denied to the subject on certain conditions. Conditional propositions are rather a compound proposition with conditional connectors. Eg:

> **If** it does rains in time, **then** crops will be good. (A conditional sentence where the predicate is assigned conditionally)
>
> Sita will not go **unless** she is invited. (A conditional sentence where the predicate is denied conditionally)

Compound proposition: Sometimes more than one proposition is asserted in combination in a single sentence such as "Mohan is a student and he is intelligent". Here, one proposition is that "Mohan is a student" and another proposition is "Mohan is intelligent". Such proposition is called compound proposition. So, a compound proposition has at least two simple propositions as components.

Compound proposition may be conjunctive, disjunctive, and alternative.

Conjunctive: When two simple propositions are joined by "and" it is called a conjunctive proposition. Eg:

> Ram is a student **and** Mohan is a player.

Disjunctive: In disjunctive proposition two simple propositions are joined by "either, or" relation. Eg:

> **Either** I will take ice cream **or** I will take chocolate.

Alternative: The alternative compound propositions are also joined by "either, or" relation. Eg:

> Either I will drink tea or I will take coffee.

There is, however, **difference between disjunctive and alternative propositions** which can be deciphered through context only. A disjunctive proposition is 'inclusive' sense of 'either, or'. This sense of 'either, or' includes the possibility of '**both**' the options such as one may take both ice cream and chocolate at the same time. The 'exclusive' sense of 'either, or'

suggests a meaning according to which it is simply '**not both**'. Alternative proposition is the exclusive sense of 'either, or'. The example cited above states that either a person will take tea or he will take coffee but not both at the same time. Alternative sense of 'either, or' thus excludes the possibility of both.

2.3 Categorical proposition

A categorical proposition asserts something about a class of objects or persons and is identified by its *quantity* (universal or particular) and *quality* (affirmative or negative); the four logical forms—A (universal affirmative), E (universal negative), I (particular affirmative), and O (particular negative)—represent all possible combinations, serving as the standard structure for logical reasoning.

Meaning of categorical proposition

When the subject of a proposition indicates a class of objects, persons or events, the proposition is called as categorical (indicating category or class membership). [CBSE Philosophy XI 2011 p 64]. For example, ‘Some cats are black.’. Here, the term ‘some’ indicates that some members of a class 'cat' are 'black'. A categorical proposition is identified as well as classified by its quantity and quality.

Quantity of a categorical proposition refers to the number of members in the class represented by the **subject** of a proposition. It may refer to **all** the members of a class (universal) or to **some** of the members of a class (particular). For instance, in the proposition, "All men are mortal", the subject 'All men' denotes the entire class of 'man' and the quantity of the proposition is universal. In the proposition "No egg is red", again, the quantity is universal. Here the entire class of eggs is excluded from the

entire class of red things. However, when the subject of a proposition indicates only part of a class, the quantity of the proposition is particular. For instance, in the proposition "Some cats are black", the quantity is particular and similarly, in the proposition, "Some roses are not red things", the quantity is particular. Thus, subject of a universal proposition indicates unrestricted generalization, whereas subject of a particular proposition indicates only restricted generalization.

Quality of a categorical proposition indicates whether a proposition is **affirmative** or **negative**. This is done through **copula**. If a predicate is assigned to subject, then quality of the proposition is affirmative. For instance, in the proposition, "All roses *are* beautiful", the predicate 'beautiful' is assigned to the subject 'roses' through the copula 'are'. If a predicate is denied to subject, then quality of the proposition is negative. For instance, in the proposition "Some students *are not* voters" predicate being 'voter' is denied to the subject 'students' through the copula 'are not'. However, a negative term like 'immortal', 'unwise' etc. does not make a proposition negative. It is negative copula which makes a proposition negative. For example, "Some men are illiterate", is an affirmative proposition with a negative predicate whereas "Some men are not literate", is a negative proposition.

Types of categorical proposition

Quantity and quality of the categorical proposition together give four types of categorical proposition:

(i) Universal affirmative (or A proposition),
(ii) Universal negative (or E proposition),
(iii) Particular affirmative (or I proposition), and
(iv) Particular negative (or O proposition).

The letter A, E, I, and O is derived from Latin word *affirmo* (= I affirm) and *nego* (= I deny) such that 'A' and 'I' of ***affirmo*** for universal and particular affirmative respectively and 'E' and 'O' of ***nego*** for universal and particular negative respectively. [Copi 2014 p 174]

Universal affirmative: In universal affirmative A proposition, quantity is universal and quality is affirmative. Logically it is represented as: All S is P. Eg:

> All cats are mammals.

Universal negative: In universal negative or E proposition quantity is universal and quality is negative. Logically it is represented as: No S is P. Eg:

> No child is a voter.

Particular affirmative: In particular affirmative or I proposition quantity is particular and quality is affirmative. Logically it is represented as: Some S is P. Eg:

> Some students are voters.

Particular negative: In particular negative or O proposition quantity is particular while the quality is negative. Logically it is represented as: Some S is not P. Eg:

> Some roses are not red.

In our day-to-day life, however, our arguments do not always contain propositions which are in clear and neat logical form. In sciences also universal or particular statements are not in the logical form. But for the logicians the validity of arguments needs the premises and the conclusion (which are also propositions) to be in the standard logical form. This aim, nevertheless, can be achieved by reducing the non-standard form

sentences into logical form of A, E, I, O. In this process the meaning of the propositions should not be lost. In fact, the meaning of the proposition is the guide to tell us which type of proposition it is. For instance, "Every voter is citizen" means "All voters are citizens". Similarly, the sentence "Many students of this class are bright children" is "Some students of this class are bright children". "A few politicians are statesmen" is "Some politicians are statesmen".

2.4 Terms

A 'term' is a word or group of words serving as the subject or predicate of a proposition, representing a class defined by its extension (denotation — members of the class) and intension (connotation — essential attributes); only general terms have both, and as the intension of a term increases by adding attributes, its extension proportionally decreases.

Meaning of Term

The word 'term' comes from the Latin word *terminus*, a limit or boundary. Terms limit the movement of the thought. Proposition is a unit of reasoning and terms are its constituents. [CBSE Philosophy XI 2011 p 68]

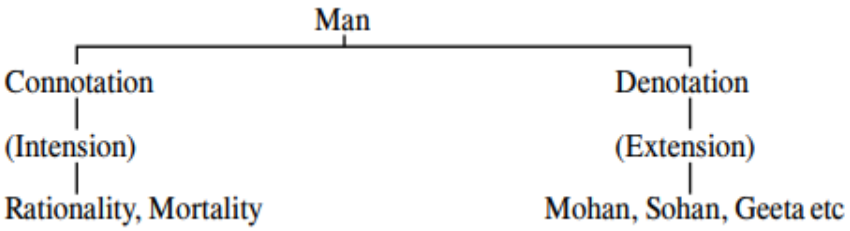
A term may be defined as a word or group of words which is either a subject or a predicate of a proposition with a definite meaning of its own. If a word or a group of words is neither a subject nor a predicate of a proposition, then it is not a term. In the proposition, "All logicians are mathematicians", 'logicians' and 'mathematicians' are terms but 'all' and 'are' are not terms. For they can neither be subject nor predicate of the proposition. Thus, whereas all terms are words, all words are not terms. This is because all terms are classes for the traditional thinkers. In each

categorical proposition (A, E, I, O) there are two terms, a subject and a predicate.

Extension (denotation) and Intension (connotation) of term

A term in a categorical proposition represents a class. [CBSE Philosophy XI 2011 p 69].

A class is a collection of all objects that have some specified characteristics in common. The meaning of a class or term can be known in two ways. Firstly, by knowing the members belonging to that particular class (denotation or extension of the term); and secondly, by knowing the essential qualities possessed by the members of that class (connotation or intension of the term). For example, in the class of 'man' we refer to all 'human beings' as members, and 'rationality' and 'mortality' as the essential attributes or qualities possessed by them.



The connotation of the term does not always refer to all attributes, essential or accidental. Connotation indicates only essential attributes of an object ie such attributes that are sufficient to distinguish that object from other objects. The bare minimum qualities without which the existence of a thing, person or an object is not possible. For example, the essential characteristics of term 'man' are only 'rationality' and 'mortality'. The accidental characteristics of 'man' are many like a man has two hands, two legs, two ears etc. There are men who do not have hand or leg. Man can exist without these accidental characteristics. But we will not call living being a man if he is

immortal or if he is irrational. Rationality differentiates a man from 'animals', 'mortality' differentiates a 'man' from 'super human beings'.

Not all terms, however, have both denotation and connotation. Only the general terms (which are classes) have both connotation and denotation. The proper names like Ram, Sita, Mohan etc. do not have proper connotation. 'Ram' for example can refer to the student of standard X in the Y school or it can refer to a boy working in a factory or to a mythical character of Ramayana. Similarly, the imaginary objects do not have proper denotation. For example, a centaur (a creature from Greek mythology with the upper body of a human and the lower body and legs of a horse) has no reference, and thus has no denotation. At the same time there are things which can be only known through denotation and not through connotation. For example, we can know the colours – red, yellow etc. only by looking at them. A blind man can never know the colours by stating or describing their characteristics. One learns meanings of terms quickly and correctly by looking at the objects and things, but from the view point of a logician connotation of a term is more basic and fundamental than denotation. There are classes which are empty like class of the 'square round objects'. Neither any example of this class is there nor can it be found. Yet the class is meaningful because of its connotation.

Increase or decrease of extension or intension

When attributes are added to the intension of a term, we say that the intension increases. [Copi 2014 p 91-92]

Begin with a general term such as “person.” Add “living.” Add “over twenty years old.” Add “born in India.” With each such addition the intension increases; the intension of the term,

"Living person over twenty years old born in India," is far greater than that of "person." So, these terms are given here in order of increasing intension. However, increasing their intension decreases their extension. The number of living persons is much lower than that of persons, and the number of living persons over twenty years old is lower still, and so on. Thus, the extension of a term (its membership) is determined by its intension; however, the reverse is not true ie the extension of a term does not determine its intension.

2.5 Argument

An argument is a set of propositions where one (the conclusion) is affirmed on the basis of others (the premises) that support it. Arguments are of two types—deductive, where the conclusion follows with absolute necessity from the premises, and inductive, where the conclusion follows only with probability. Deductive arguments are either valid or invalid, while inductive arguments vary in strength depending on available evidence and may be reinforced or weakened by new information.

Meaning of Argument

With propositions as building blocks, an argument is constructed. In an argument one proposition is affirmed on the basis of some other proposition positing an inference. And, for every possible inference there is a corresponding argument. [Copi 2012 p 5]

Argument need not involve disagreement or controversy; it refers strictly to any group of propositions of which one (conclusion) is claimed to follow from the others (premises). Premises are regarded as providing support for the truth of the conclusion. Eg:

'Every law is an evil, for every law is an infraction of liberty.'

Although this is only one short sentence, it is an argument because it contains two propositions, of which the first (every law is an evil) is the conclusion and the second (every law is an infraction of liberty) is the premise.

Deductive and inductive argument

Every argument makes the claim that its premises provide grounds for the truth of its conclusion; that claim is the mark of an argument. However, there are two very different ways in which a conclusion may be supported by its premises, and thus there are two great classes of arguments: the deductive and the inductive. [Copi 2012 p 24]

A deductive argument makes the claim that its conclusion is supported by its premises **conclusively** ie the conclusion is claimed to follow from its premises with absolute necessity, this necessity not being a matter of degree and not depending in any way on whatever else may be the case.

An inductive argument, in contrast, does not make such a claim ie the conclusion is claimed to follow from its premises only with **probability**, this probability being a matter of degree and dependent on what else may be the case.

Strength of the conclusion

Because an inductive argument can yield no more than some degree of probability for its conclusion, it is always possible that additional information will strengthen or weaken it. Newly discovered facts may cause us to change our estimate of the probabilities, and thus may lead us to judge the argument to be better (or worse) than we had previously thought. In the world of inductive argument - even when the conclusion is judged to be very highly probable - all the evidence is never in. New

discoveries may eventually disconfirm what was earlier believed, and therefore we never assert that the conclusion of an inductive argument is absolutely certain. [Copi 2012 p 25]

Deductive arguments, on the other hand, cannot become better or worse. They either succeed or they do not succeed in exhibiting a compelling relation between premises and conclusion. If a deductive argument is valid (ie it succeeds in linking, with logical necessity, the conclusion to its premises), no additional premises can possibly add to the strength of that argument.

2.6 Reasoning

Reasoning is the mental process of drawing conclusions (inferences) from facts or propositions, comprising deduction (inferring particulars from general premises) and induction (inferring general laws from particular facts), both grounded on the laws of uniformity of nature and causation; analogy, a weaker form of induction, proceeds from one particular to another based on resemblance, often used to extend reasoning where direct rules are absent.

Meaning of Reasoning

Knowledge is a set of propositions that guide human behaviour. This is substantiated by CBSE Philosophy XI 2011 p 54: ‘Human knowledge is mainly constitutive of propositions. Knowledge grows through reasoning.

Reasoning is *inferring conclusion from the premises*. In other words, reasoning is the process of deduction and induction. In deduction (formal reasoning) we infer a new proposition (conclusion) from a given set of existing propositions (premises). Whereas in induction (empirical reasoning) we infer the new proposition (conclusion) from observations ie we draw universal

statements on the basis of particular facts. Inference is the cognitive process of establishing conclusion either from the proposition or from the observation. Inference is cognitive in the sense that it is psychological that goes in mind. It is a conscious intellectual activity such as thinking or remembering. Conclusion implies generalisation; culling out a general rule.

Deduction

Deduction is a process in which one infers a conclusion from a given set of premises. In deduction we infer a conclusion from a given set of premises (propositions). The conclusion is either a particularisation or of equal generalization as that of premises; but in no case it goes beyond premises. [CBSE Philosophy XI 2011 p 10] Eg:

> All men are mortal.
>
> Ram is a man.
>
> Therefore, Ram is mortal.

Immediate and mediate inference: In formal reasoning or deduction an inference may either be drawn from one premise or more than one premise. If an inference is drawn from just one premise it is called **immediate inference** and where there is more than one premise, it is called **mediate inference**. [CBSE Philosophy XI 2011 p 80]

Square of opposition and **eduction** are the two instances of immediate inference whereas **syllogism** is the instance of mediate inference where there are only two premises, and the conclusion follows from them jointly. Where inference is drawn from more than two premises then it is **non-syllogistic mediate inference.**

Induction

Induction is a process of inference in which we draw universal statements or scientific laws on the basis of particular facts. Experiences furnish us with particular facts and not with universal truths. For example, experiences inform us that some men whom we know are dead. But on the basis of these few instances, we draw a universal conclusion that all men are mortal. This is inductive procedure. [CBSE Philosophy XI 2011 p 2] A concrete example of induction is:

> Ram is mortal.
>
> Shyam is mortal.
>
> Gita is mortal.
>
> …
>
> Therefore, all men are mortal.

In induction the conclusion is more general than the premises because the number of instances observed is very small compared to the full number of which the statement is made. Induction relies on two fundamental principles, viz., the law of uniformity of Nature and the law of causation. These laws are called the formal grounds of induction.

The law of uniformity of Nature: The law of uniformity of Nature has been expressed in various forms such as, "Nature is uniform", "The future resembles the past", "Nature repeats itself". These various expressions mean that Nature behaves in the same way under the similar circumstances. If the same circumstances occur the same events will follow. In other words, if water quenched our thirst or fire burnt us in the past under certain circumstances, water will quench our thirst and fire will burn us in future under similar circumstances. Thus, relatively

speaking the law implies that there is no such thing as whim or caprice in Nature. At first sight Nature does not appear to be uniform. It is true that in Nature various kinds of phenomena occur but all these phenomena depend for their occurrences on certain conditions and if these conditions occur then the phenomena will occur. Consequently, corresponding to the various departments of Nature, there are laws. There is not one uniformity or law governing the whole universe but there are various uniformities or laws governing the various departments of Nature. And these are not distinct but are parts of one system. Hence, we speak of unity of Nature. The law of uniformity of Nature is a postulate or formal ground of induction. It forms the very basis of all inductive generalizations that from the particular facts we draw universal conclusion. [CBSE Philosophy XI 2011 p 3]

The law of causation: The law of causation is second formal ground of inductive generalization. It states, "Every event has a cause" or as J.S. Mill puts it, "Every phenomenon which has a beginning must have a cause". It is the guiding principle of inductive generalizations. This law guarantees the formal truth of inductive generalization. According to some logician causation is a special kind of uniformity. According to certain other logician law of causation and law of uniformity of Nature are two distinct laws and they together constitute the formal grounds of induction. [CBSE Philosophy XI 2011 p 3]

Distinction between deduction and induction

In induction, as we have seen, we infer more comprehensive conclusion than the premises whereas in deduction we infer lesser or of equal strength of conclusion as of our premises. Like analysis and synthesis, deduction and induction mutually imply

each other. Neither gives a complete account of knowledge of any object without the other. The work of the one is not over before the other begins. The process of acquiring knowledge involves both deduction and induction. Induction first completes the work of establishing the universal propositions or premises and deduction then explains the particulars in the light of that universal proposition. Not only do deduction and induction mutually involve one another they also proceed to the same ultimate principle. They differ in their starting point and not in their principle. In deduction we start with general principles and reach to its consequences, while in induction we start with the facts of observation and discover a general principle. In other words, the real process of inference in each case is the same, viz., an insight into the connection of facts according to some general principles. [CBSE Philosophy XI 2011 p 11]

Analogy

Analogy is a weak form of Induction. Analogy is a kind of inference which proceeds from particular to particular. It is based on imperfect similarity and is only probable in character. The ground of inference in analogy is resemblance. [CBSE Philosophy XI 2011 p 8]

Symbolically, analogy may be represented as –
"A resembles B in certain properties, viz., x, y, z. B further possesses the property m. Therefore, A possesses the property m, even though no connection is known to exist between m and common properties x, y, z."

In law, analogy often bridges gaps where statutes are silent. For example, if tenancy law grants protection to 'houses' used as residences, and a tenant occupies a flat, the court may reason by analogy that a flat resembles a house in essential respects (being

a dwelling, providing shelter, used for habitation). Therefore, the flat also falls under the protection.

Distinction between analogy and induction

According to logicians, analogy possesses the main characteristic of induction, i.e., an inductive leap from the known to the unknown. [CBSE Philosophy XI 2011 p 8]

However, analogy differs from induction in the following respects:

1. In analogy, we proceed from particular to particular, whereas induction establishes a general proposition.
2. Induction is based on the knowledge of a causal connection, while in analogy no such knowledge is involved.

2.7 Syllogism

A syllogism is a form of *deductive reasoning* where a conclusion is logically derived from two premises — a major and a minor — each containing one of three terms (major, minor, and middle). The three main types are: categorical syllogism (using A, E, I, O propositions), hypothetical syllogism (using conditional statements), and disjunctive syllogism (using "either–or" premises). A syllogism is in *standard form* when the major premise precedes the minor premise, followed by the conclusion.

Meaning of Syllogism

Syllogism is an application of deductive reasoning to infer conclusion based on two propositions (major and minor) that are asserted or assumed to be true.

Syllogism is as old as human thoughts. The very method of reasoning is based on syllogism. We can infer it in the conversation of Abraham and Mosses with their God. Crediting its invention to Socrates / Aristotle is to belie the religious anthologies, may be to prove the secularism of the investigation. It can, however, safely be said that the Socrates / Aristotle might have institutionalised the methodology as a subject of study. The human mind decides (reaches to a conclusion) anything in a syllogistic way. The general proposition stored in the mind acts as a touchstone whereupon a particular instance is tried and tested and the conclusion is drawn about the nature of that instance. A logician calls these three aspects of an argument as major premise, minor premise and conclusion. For example, in the argument – All men are mortal; Socrates is a man; therefore, Socrates is mortal. – the first proposition 'All men are mortal' is the major premise, the second proposition 'Socrates is a man' is an instance or minor premise, and the third proposition 'therefore Socrates is mortal' is the conclusion drawn from major and minor premises.

Categorical syllogism: A categorical syllogism is a syllogism which makes use of categorical propositions that is A, E, I and O. [CBSE Philosophy XI 2011 p 86]

For example,

Premise 1: All monarchs are dictators.

Premise 2: Some monarchs are great scholars.

Conclusion: Therefore, some great scholars are dictators.

Hypothetical syllogism: Hypothetical syllogism is a syllogism having a conditional statement as one or both the premises. [CBSE Philosophy XI 2011 p 87]

For example,

Premise 1: If surplus food grain is not distributed in time, it will be destroyed.

Premise 2: Surplus food grain is not distributed in time.

Conclusion: Therefore, food grain will be destroyed.

Disjunctive syllogism: Disjunctive Syllogism is a syllogism having a disjunctive statement as one of its premises. [CBSE Philosophy XI 2011 p 87]

For example,

Premise 1: Either John is going to the party or Mary is going to the party.

Premise 2: John is not going to the party.

Conclusion: Therefore, Mary is going to the party.

Structure of syllogism

Since each proposition consists of two terms (subject and predicate), the three propositions (two premises and one conclusion) of syllogism must consist of three terms with each term occurring twice. [CBSE Philosophy XI 2011 p 88]

For example:

All self- confident persons are mentally strong.

No coward is mentally strong.

Therefore, no coward is self- confident person

The three categorical propositions in the above example contain exactly three terms that is ‘self-confident person’ ‘mentally strong’ and ‘coward’. To identify the terms by name we look at the conclusion. The predicate of the conclusion is called the **major term** (P). The subject of the conclusion is called the

minor term (S). The term which occurs in both the premises but not in the conclusion is called the **middle term** (M). In the above example, the term 'self-confident' person is the major term 'coward' is the minor term and 'mentally strong' is the middle term.

The premises of a syllogism also have names. Each premise is named after the term that appears in it. The premise that contains the major term is called the **major premise**. In the example 'self-confident person' is the major term, so the premise "All self-confident persons are mentally strong" is the major premise. The premise containing the minor term is called the **minor premise**. In the example, 'coward' is the minor term so "No coward is mentally strong" is the minor premise. It is the minor premise not because of its position but because it is the premise that contains the minor term.

A syllogism is said to be in **standard form** when its premises are arranged in a specified standard order. In a standard form of syllogism, the major premise is always stated first, the minor premise is second and the conclusion is last.

2.8 Logic

Logic is the systematic study of reasoning that distinguishes valid from invalid arguments, focusing on the *form* or *structure* rather than the truth of statements; validity concerns the logical connection between premises and conclusion, while truth concerns their correspondence with reality—together forming *soundness*. Logical form determines validity, making it essential for reasoning across disciplines such as mathematics, science, and computing, where logic underpins deduction, formal proofs.

Meaning of Logic

Logic is the study of methods and principles used to distinguish between correct and incorrect reasoning.

When one reasons about any matter, he produces averments (premises) to support his statement (conclusion). However, not all reasons are good reasons. Therefore, one may always ask, when confronted with an argument: Does the conclusion reached follow from the premises assumed? To answer this question there are objective criteria which is studied in logic.

Validity and truthfulness

A logician is concerned with the **validity** of the argument and not with the **truthfulness** of propositions.

Truth is an *empirical* relation between the statement and what it asserts or denies about reality and may therefore vary with the additional information obtained through observation. The truth value of the conclusion always depends upon the truth value of the premises and if the truth value of the premises varies the truth value of the conclusion will also vary. [CBSE Philosophy XI 2011 p 55]

Validity is a *logical* relation between premises and conclusion. A valid deductive argument indicates that the premises are supposed to provide absolute guarantee for the conclusion even though it may lack truth value. [CBSE Philosophy XI 2011 p 55]

A logician who evaluates the argument is interested in the arguments as such ie he is not concerned about the truth or falsity of the conclusions drawn but will be concerned either about the form of an argument under consideration, to determine if that argument is of a kind that is likely to yield a warranted (correct)

conclusion, or will be concerned about the quality of the argument, to determine whether it does in fact yield a warranted conclusion.

Rules of validation

The connection between the truth and validity is by no means a simple one. There are some generic rules, however, through which this relationship can be best understood along with examples. It will also help us to ward off some likely misconceptions about these notions.

Rule 1 - True premises do not guarantee validity: The following example exemplifies this rule.

Cows are mammals.

Dogs are mammals.

Therefore, dogs are cows.

Rule 2 - A true conclusion does not guarantee validity: The following example exemplifies this rule.

Cars are mammals.

Tigers are mammals.

Therefore, tigers are cats.

Rule 3 - True premises and a true conclusion together do not guarantee validity: The following example exemplifies this rule.

Cars are mammals.

Tigers are mammals.

Therefore, tigers are cats.

Rule 4 - False premises do not guarantee invalidity: The following example exemplifies this rule.

Birds are mammals.

Cats are birds.

Therefore, cats are mammals.

Rule 5 - A false conclusion does not guarantee invalidity: The following example exemplifies this rule.

Cats are birds.

Dogs are cats.

Therefore, dogs are birds.

Rule 6 - False premises and a false conclusion together do not guarantee invalidity

Thus, while the truth of proposition and the validity of reasoning are distinct, the relationship between them is not entirely straight forward. When an argument has true premises and a false conclusion, it must be invalid. This is how we define invalidity. Although we can speak of valid and invalid arguments and argument-forms, it makes no sense to speak of valid or invalid statements. Nor does it make sense to call an argument as true or false. Validity and invalidity are properties of arguments; truth and falsity are properties of statements. Again, we should not be misled by true premises or true conclusion to suppose that that an argument is valid. Nor should we be misled by false premises or false conclusion to suppose that it is invalid. As a matter of fact, truth and validity are combined in the concept of soundness. An argument is sound if all its premises and conclusion are true, and its reasoning is valid; all others are unsound.

Logical form

A question arises as to how we can be sure that in valid argument there could be no possible way for premises to be true and conclusion to be false. How can we possibly prove such a thing? The answer to this question lies in the concept of form, pattern, or structure. To say that an argument could not possibly have true premises and a false conclusion is simply to say that it has a certain kind of form which does not admit of instances of such kind. It is the form of an argument, then, which determines its logical validity. Whether an argument is valid or invalid is determined entirely by its form. Let us examine the following example:

P1. All men are mortal.

P2. Socrates is man.

C: Therefore, Socrates is mortal.

What makes the above argument a valid argument has nothing to do with, Socrates, men or mortality. Rather each sentence in the argument exhibits a pattern, a logical form, which guarantees the truth of the conclusion given the truth of premises. More generally, the logical form of a sentence of natural language is what determines both its logical properties and its logical relations to other sentences. The logical form of a sentence of natural language is typically represented in a theory of logical form by well-formed formula in a logically pure language. In this language all meaningful symbols are expressions with fixed and distinct logical meaning. The arguments' validity is explained by the fact that premises formally entail (implies) the logical form of conclusion. Thus, the primary function of a theory of logical form is to explain a broad range of logical phenomena in terms of logical forms which it essentially assigns to sentences of natural language.

Logic and mathematics

Logic is one of the pillar stones on which mathematics rests, the other two being the set theory and the number theory. Mathematics deduces conclusions from self-evident truths or axioms and deduces further other conclusions from these. This brings order to the complicated abstractions of mathematics.

Quantifiable sciences like physics, chemistry and engineering use deductive methods to draw definite conclusions from their axioms. Qualitative sciences like biology, physiology, medicine and also the social sciences like economics, sociology and psychology use logic by observing particular facts, comparing and classifying them and then seek to explain them by general laws. They adopt the inductive methods and their conclusions are more or less probable. Thus, all the sciences apply logic to their methods of investigations.

The enormous success of computers in recent times owes a lot to logic. The growth and development of computers is largely due to logic. The complex electronic circuits are designed to work primarily on binary (two-valued) logic. The relationship between computer architecture and logic is best seen in a new branch of logic called **computational logic**. Further, a new three valued **fuzzy logic** has given a new direction to the present technology regarding controls. It is used for developing sophisticated control systems. Fuzzy logic addresses control applications perfectly as it resembles human decisions with an ability to generate precise solutions from certain or approximate information. For example, let's take a fuzzy washing machine. A load of cloths in it and we press start button; now the machine churns automatically choosing the best cycle for washing.

There are other kinds of logic which are very popular such as **modal logic** (relating to mode or form as opposed to substance) which is designed to express the logical structure of statements that contain modal terms like ‘possible’, ‘necessary’ and their variants. **Temporal logic** connected with the notions of time. **Deontic logic** (relating to duty and obligation as ethical concepts) is an attempt made to extend the arena of logic to certain kinds of reasoning in ethics. It deals with the ethical notions of permission, obligation and the like. Several deontic systems were developed but Nicholas Rescher's system is the most popular amongst all. **Epistemic logic** (relating to knowledge and its validation) is an attempt to extend resonating to discourses which are connected with the notions of 'knowledge' and 'belief'. These are all specialized branches analysing different types of discourses which are beyond the scope of this book. Today logic is sited at the intersection of philosophy, mathematics, linguistics and computer science as it deals with the structure of reasoning and the formal features of information. Regardless of advances in its allied areas, logic thrives. Its techniques are applied to many different domains of reasoning, and its connections with linguistics and computer science have strengthened the discipline and brought it new applications.

2.9 Fallacy

A fallacy is an error in reasoning where the premises fail to justify the conclusion, commonly classified as fallacies of relevance, defective induction, presumption, or ambiguity; cherry picking—often arising from confirmation bias—is a key example, where selective or biased use of evidence supports pre-existing beliefs while ignoring contradictory data.

Meaning of Fallacy

An argument becomes fallacious when the premises of an argument fails to support its conclusion.

While reasoning effort is made to reason correctly but many times error creeps in and the argument becomes fallacious when the premises of an argument fails to support its conclusion. Typical errors in reasoning are termed as fallacies and are broadly categorised as fallacies of:

(1) relevance,
(2) defective induction,
(3) presumption, and
(4) ambiguity.

Cherry picking and confirmation bias

A man sees what he wants to see, and disregards the rest. This fallacy known as cherry picking, or suppressing evidence, or the fallacy of incomplete evidence, is the act of pointing to individual cases or data that seem to confirm a particular position while ignoring a significant portion of related and similar cases or data that may contradict that position. It is a kind of fallacy of selective attention, the most common example of which is the confirmation bias. Cherry picking may be committed intentionally or unintentionally.

Confirmation bias is the tendency to search for, interpret, favor, and recall information in a way that confirms or supports one's prior beliefs or values. It is an important type of cognitive bias that has a significant effect on the proper functioning of society by distorting evidence-based decision-making. People display this bias when they gather or remember information selectively, or when they interpret it in a biased way. For example, a person

may cherry-pick empirical data that supports one's belief, ignoring the remainder of the data that is not supportive. People also tend to interpret ambiguous evidence as supporting their existing position. The effect is strongest for desired outcomes, for emotionally charged issues, and for deeply entrenched beliefs.

2.10 Fallacies of relevance

Fallacies of relevance arise when arguments rely on emotional or psychological appeal rather than logical connection between premises and conclusion. Instead of providing valid reasoning, such fallacies divert attention or manipulate sentiment. Examples include appealing to popularity (*ad populum*), pity (*ad misericordiam*), or force (*ad baculum*); attacking a person instead of their argument (*ad hominem*); misrepresenting an opponent's view to refute it easily (*straw man*); distracting from the issue with irrelevant points (*red herring*); or drawing an unrelated conclusion (*ignoratio elenchi*).

Nature of fallacies of relevance

Fallacies of relevance happens when the premises of the argument are simply not relevant to the conclusion though they are deceivingly made to appear as relevant.

These are bald mistakes and arise when some emotive features of language are used to support the truth of a claim for which no objective reasons have been given. Since there is no real connection between the premises and the conclusion of an argument, the premises offered cannot possibly establish the truth of the conclusion drawn. Of course, the premises may still be psychologically relevant, in that they may evoke attitudes likely to cause the acceptance of the conclusion. Such fallacies are:

Appeal to the populace (*Argumentum ad Populum*)

This fallacy is sometimes defined as the fallacy committed in making an emotional appeal; but this definition is so broad as to include most of the fallacies of relevance. It is defined more narrowly as the attempt to win popular assent to a conclusion by arousing the feelings of the multitude. The argument ad populum ("to the populace") is the baldest of all fallacies, and yet it is one of the most common. It is the instrument on which every demagogue and propagandist relies when faced with the task of mobilizing public sentiment. It is a fallacy because, instead of evidence and rational argument, the speaker (or writer) relies on expressive language and other devices calculated to excite enthusiasm for or against some cause. So, a conclusion defended with premises that are directed mainly at emotions is a fallacious argument ad populum.

Indian context: This fallacy arises when arguments rely on popular emotions rather than logic or evidence. It occurs when a speaker seeks to gain support by appealing to mass sentiment, national pride, religion, caste, or ideology instead of providing rational proof. Commonly seen in political debates, social media, and public campaigns, such appeals manipulate collective feelings to win acceptance of a conclusion. For example, claiming that a policy is correct merely because "the entire nation supports it" or that "true patriots believe this" commits the *ad populum* fallacy—substituting emotional appeal for reasoned argument.

Appeal to pity (*ad Misericordiam*)

One variety of the appeal to emotion that appears with great frequency is the argument ad misericordiam. The Latin word misericordiam literally means "merciful heart"; this fallacy is the

emotional appeal to pity. Pity is often an admirable human response. Justice, it is wisely said, should be tempered with mercy. Surely there are many situations in which leniency in punishment are justified by the special circumstances of the offender. In such situations—in the sentencing phase of a trial, for example—the identification of those circumstances and the reasons they might apply to a criminal already convicted are appropriately put before the court. That is no fallacy. It would be a fallacy, however, if such considerations were registered in the effort to cause a jury to acquit a defendant who is indeed guilty of the acts with which he or she is charged. When the premises (or intimated premises) of an argument boil down to no more than an appeal to the merciful heart, the argument is plainly ad misericordiam, and fallacious. What is special about this variety is only that the emotions appealed to are of a particular kind: generosity and mercy. Logicians give special names to other clusters of fallacious emotional appeals. Thus one might also distinguish the appeal to envy (ad invidiam), the appeal to fear (ad metum), the appeal to hatred (ad odium), and the appeal to pride (ad superbium). In all of these, the underlying mistake is the argument's reliance on feelings as premises.

Indian Context: This fallacy arises when an argument seeks acceptance of a claim or decision by appealing to sympathy or compassion rather than presenting rational grounds. The term *misericordiam* means "merciful heart." While mercy is a valued principle in Indian jurisprudence—reflected in Article 72 and 161 of the Constitution granting clemency powers to the President and Governors—its use is legitimate only after guilt or liability has been lawfully established.

For instance, during sentencing, courts may consider mitigating factors such as age, health, or socio-economic hardship. However, it would be fallacious to invoke pity to secure acquittal of a person clearly proved guilty, or to justify administrative leniency where legal norms mandate accountability. Thus, the *ad misericordiam* fallacy occurs when emotional appeal to compassion replaces logical or evidentiary reasoning—whether in judicial argument, public discourse, or political persuasion.

Red herring (Fallacy of Distraction)

The red herring is a fallacious argument whose effectiveness lies in distraction. Attention is deflected; readers or listeners are drawn to some aspect of the topic under discussion by which they are led away from the issue that had been the focus of the discussion. They are urged to attend to some observation or some claim that may be associated with the topic, but that is not relevant to the truth of what had originally been in dispute. A red herring has been drawn across the track. This fallacy has a fascinating history. The phrase is believed to have been derived from the practice of those who tried to save a fox being hunted by leaving a misleading trail of scent (a smoked herring is very smelly and does become dark red) that would be likely to distract or confuse the dogs in hot pursuit. In many contexts, any deliberately misleading trail is commonly called a red herring. Especially in literature, and above all in suspense or detective stories, it is not rare for some character or event to be introduced deliberately to mislead the investigators (and the readers) and thus to add to the excitement and complexity of the plot. An ulterior political motivation may be suggested, a sexual scandal may be intimated—whatever can put the reader off the track may serve as a red herring. In the very popular novel and film, The Da

Vinci Code, one of the characters, a Catholic bishop, enters the plot in ways that very cleverly mislead. His name is the author's joke: Bishop Aringarosa—meaning "red herring" in Italian.

Indian Context: A *red herring* is a fallacy that diverts attention from the main issue by introducing an irrelevant topic, thereby misleading the audience. In Indian discourse, this often occurs in parliamentary debates, legal arguments, or public discussions when a speaker shifts focus from a policy or judicial question to unrelated emotional or political issues — for instance, diverting a debate on education reform to communal or historical grievances. The fallacy lies in distraction rather than reasoning: while the new point may seem related, it does not address the issue under consideration. The term "red herring" figuratively refers to a false trail or misleading distraction drawn across the logical path of discussion.

Straw man

It is very much easier to win a fight against a person made of straw than against one made of flesh and blood. If one argues against some view by presenting an opponent's position as one that is easily torn apart, the argument is fallacious, of course. Such an argument commits the fallacy of the straw man. One may view this fallacy as a variety of the red herring, because it also introduces a distraction from the real dispute. In this case, however, the distraction is of a particular kind: It is an effort to shift the conflict from its original complexity into a different conflict, between parties other than those originally in dispute.

Indian context: In Indian discourse—whether in politics, law, or public debate—the *straw man fallacy* occurs when someone misrepresents another's argument in a weakened or distorted form to refute it easily. Instead of addressing the actual point, the

debater constructs a simplified or exaggerated version of the opponent's stance and attacks that instead. For instance, if one argues for stricter environmental regulation and the opponent replies, "You want to stop all industrial development," the response is a *straw man*. The fallacy shifts attention from the real issue to an artificial one, thus misleading both the argument and the audience.

Argument against the person (*Argumentum ad Hominem*)

Of all the fallacies of irrelevance, the argument against the person, or ad hominem, is among the most pernicious. Such arguments are common, as many fallacies are. These, in addition to being unfair to the adversary (as straw man arguments are also), are hurtful, often inflicting serious personal damage without any opportunity for the fallacy to be exposed or its author chastised. The phrase ad hominem translates as "against the person." An ad hominem argument is one in which the thrust is directed, not at a conclusion, but at some person who defends the conclusion in dispute. This personalized attack might be conducted in either of two different ways, for which reason we distinguish two major forms of the argument ad hominem: the abusive and the circumstantial.

One is tempted, in heated argument, to disparage the character of one's opponents, to deny their intelligence or reasonableness, to question their understanding, or their seriousness, or even their integrity. However, the character of an adversary is logically irrelevant to the truth or falsity of what that person asserts, or to the correctness of the reasoning employed. A proposal may be attacked as unworthy because it is supported by "radicals," or by "reactionaries," but such allegations, even when plausible, are not relevant to the merit of the proposal itself. Personal abuse can

be psychologically persuasive, however, because it may induce strong disapproval of some advocate, and by unjustifiable extension in the mind of the hearer, disapproval of what had been advocated. Ad hominem abusive has many variations. The opponent may be reviled (and his claims held unworthy) because he is of a certain religious or political persuasion: a “Papist” or an “atheist,” a member of the “radical right” or the “loony left,” or the like. A conclusion may be condemned because it has been defended by persons believed to be of bad character, or because its advocate has been closely associated with those of bad character.

The circumstances of one who makes (or rejects) some claim have no more bearing on the truth of what is claimed than does his character. The mistake made in the circumstantial form of the ad hominem fallacy is to treat those personal circumstances as the premise of an opposing argument. Thus it may be argued fallaciously that an opponent should accept (or reject) some conclusion merely because of that person’s employment, or nationality, or political affiliation, or other circumstances. It may be unfairly suggested that a member of the clergy must accept a given proposition because its denial would be incompatible with the Scriptures. Such argument is irrelevant to the truth of the proposition in question; it simply urges that some persons’ circumstances require its acceptance. Hunters, accused of the needless slaughter of unoffending animals, sometimes reply by noting that their critics eat the flesh of harmless cattle. Such a reply is plainly ad hominem: The fact that the critic eats meat does not even begin to prove that it is right for the hunter to kill animals for amusement. When the circumstances of the speaker are used not merely as grounds for attack—suggesting a foolish inconsistency or the like—but used rather in a plainly negative

spirit, a special name is given to such ad hominem arguments. They are called by their traditional Latin name, *tu quoque*. This Latin expression does not translate simply, but it means, in essence, "You're another," or more loosely, "Look who's talking." The substance of the fallacy is to contend that you (the first party) are just as bad as I am, just as guilty of whatever it is that you complained about. But of course, that response is not a refutation of the original complaint. It may be true that the first party is guilty of the conduct in question, but calling that guilt to attention does not support the innocence of the second party, which is the issue in the argument at hand. Circumstantial ad hominem arguments are sometimes used to suggest that the opponents' conclusion should be rejected because their judgment is warped, dictated by their special situation rather than by reasoning or evidence. However, an argument that is favorable to some group deserves discussion on its merits; it is fallacious to attack it simply on the ground that it is presented by a member of that group and is therefore self-serving. The arguments in favor of a protective tariff (for example) may be bad, but they are not bad because they are presented by a manufacturer who benefits from such tariffs.

One argument of this kind, called poisoning the well, is particularly perverse. The incident that gave rise to the name illustrates the argument forcefully. The British novelist and Protestant clergyman Charles Kingsley, attacking the famous Catholic intellectual John Henry Cardinal Newman, argued thus: Cardinal Newman's claims were not to be trusted because, as a Roman Catholic priest (Kingsley alleged), Newman's first loyalty was not to the truth. Newman countered that this ad hominem attack made it impossible for him, and indeed for all Catholics, to advance their arguments, because anything they

might say to defend themselves would then be undermined by others' alleging that, after all, truth was not their first concern. Kingsley, said Cardinal Newman, had "poisoned the well of discourse."

Indian context: Of all logical fallacies, *ad hominem*—the argument directed against the person rather than the issue—is among the most misleading and damaging. In Indian public, legal, and political discourse, this fallacy appears frequently when debates shift from substance to personal attack. An *ad hominem* argument seeks to discredit an individual's character, background, or affiliations instead of addressing the validity of their reasoning.

There are two major forms:

1. **Abusive ad hominem:** This occurs when the opponent's moral character, caste, religion, or ideology is attacked rather than their argument. For example, dismissing a legal reform proposal merely because it is supported by a "leftist" or "corporate lobby" is an *ad hominem* fallacy. Personal abuse or defamation may influence emotions but contributes nothing to rational evaluation.

2. **Circumstantial ad hominem:** This occurs when a person's circumstances—such as their occupation, political position, or social standing—are cited to reject their argument. For instance, claiming that a judge's opinion on judicial accountability is invalid because they belong to the judiciary, or that an environmentalist's warning is biased because they run an NGO, commits the *ad hominem* fallacy.

A variant, **tu quoque** ("you too"), is also common in Indian debate—where criticism is deflected by pointing out similar faults in the critic (e.g., "You talk of corruption, but your party is corrupt too"). This is not a defence but an evasion of the issue.

Another form, **"poisoning the well,"** occurs when a person or institution is pre-emptively discredited so that their future statements are dismissed regardless of merit—for example, alleging that "academics are always anti-government" before any argument is heard.

In all its forms, *ad hominem* reasoning violates the principle of relevance, as the personal attributes or affiliations of the speaker are irrelevant to the truth or falsity of their argument. Rational debate in democratic and judicial settings demands that positions be examined on evidence and logic—not on the personal standing of their proponents.

Appeal to force (*Argumentum ad Baculum*)

It seems odd to suppose that one could hope to establish some proposition as true, or persuade some other person of its truth, by resorting to force. Threats or strong-arm methods to coerce one's opponents can hardly be considered arguments at all. Traditionally, a category of fallacies of this kind has been identified as the appeal to force or the argument ad baculum (appeal ad baculum means literally "appeal to the stick"!), and it surely is clear that however expedient force may prove to be, it cannot replace rational methods of argument. "Might makes right" is not a subtle principle, and we all reject it. The force threatened need not be physical, of course. There are some circumstances in which threats may be introduced with more subtlety, and in such circumstances we may say that something like an argument— a plainly fallacious argument, to be sure—

has been presented. What is put forward may be a veiled threat, or a proposition that suggests some danger if the proposition in question is not given full assent. The appeal to force is the abandonment of reason.

Indian Context: In Indian reasoning and discourse, the *appeal to force* (or *argumentum ad baculum*, literally "appeal to the stick") occurs when one seeks to compel acceptance of a conclusion through threat, authority, or coercion rather than rational persuasion. This fallacy abandons reasoned debate for intimidation—whether through political pressure, social influence, administrative power, or fear of consequences.

For instance, when a superior insists that a policy must be right "because it is ordered by the government," or when public opinion is silenced through threats of reprisal instead of logical rebuttal, the argument commits this fallacy. In democratic and judicial reasoning—guided by the constitutional principle of *rule of law*—such use of force or authority is fundamentally flawed, since truth and justice must rest on evidence and logic, not on compulsion or coercive influence.

Missing the point (*Ignoratio Elenchi*)

Among the fallacies of relevance, the final category to be identified is perhaps the most difficult to describe with precision. A variety of alternative names have been applied to this category, including irrelevant conclusion and mistaken refutation. It arises when the argument goes awry—when, on close examination, there is a "disconnect" between the premises and the conclusion. The twist may on occasion be an instrument of deliberate deception, but more often the fallacy is the product of sloppy thinking, a confusion in reasoning that the author of the argument herself does not fully recognize, or grasp. Aristotle, the first to

give a systematic classification of the informal fallacies, explains the fallacy we call missing the point, or ignoratio elenchi, as a mistake that is made in seeking to refute another's argument. The Latin word elenchi is derived from a Greek word that means a "disproof," or a "refutation." An *ignoratio elenchi* is a mistaken refutation, one that goes haywire because the person presenting it does not fully understand the proposition in dispute. He refutes, or tries to refute, a claim other than that which was originally at issue. He misses the point. As an example, suppose that one person emphasizes how important it is to increase funding for the public schools. His opponent responds by insisting that a child's education involves much more than schooling and gets underway long before her formal schooling begins. That assertion is entirely reasonable, of course, but it misses the point of what was said earlier. Bypassing the hard questions by emphasizing our agreement on easy generalizations about larger objectives commits the ignoratio elenchi: It misses the point. There is a sense in which every fallacy of irrelevance is an ignoratio elenchi, because in all these fallacies there is a gap between the premises and the conclusion. Premises that are not relevant—red herrings, straw men, personal attacks—all miss the point; that is true. But this name is reserved for those fallacies of irrelevance that do not fit into other categories. The *ignoratio elenchi* is a catch-all class of fallacies: fallacies in which the premises simply fail to connect to the intended conclusion with the coherence that rational argument requires. There is another expression with similar breadth and flexibility, the widely used phrase *non sequitur*. Its meaning is "does not follow": A non sequitur is an argument in which the conclusion simply does not follow from the premises. Thus every fallacy is, in that general sense, also a non sequitur. The term non sequitur is most commonly applied

when the failure of the argument is obvious, when the gap between the premises and the conclusion is painfully wide.

Indian Context: In Indian reasoning and discourse—whether in courts, legislative debates, or public discussions—**"missing the point" (ignoratio elenchi)** occurs when the conclusion drawn is irrelevant to the issue being discussed. The argument strays from the central question, either by confusion, poor reasoning, or deliberate diversion.

For instance, in public policy debates, if one argues that "India needs better infrastructure," and another replies, "But culture and tradition are equally important," the response—though valid in itself—**misses the point** of the original argument.

In legal argumentation too, such a fallacy may appear when counsel, instead of addressing the statutory question, digresses into moral or emotional grounds irrelevant to the law in question. Thus, *ignoratio elenchi* in Indian reasoning describes any argument where the premises and conclusion lack logical connection, resembling what is also termed a *non sequitur* ("it does not follow").

2.11 Fallacies of defective induction

Fallacies of defective induction occur when premises, though relevant, lack sufficient strength to justify the conclusion. They include assuming a claim is true merely because it has not been disproved (*argument from ignorance*), accepting an assertion based on the opinion of an unqualified authority (*appeal to inappropriate authority*), mistaking mere sequence for causation (*false cause*), and drawing sweeping conclusions from inadequate or unrepresentative evidence (*hasty*

***generalization*). In each case, the reasoning is flawed because the evidence fails to substantiate the conclusion.**

Nature of fallacies of defective induction

Fallacies of defective induction happen when the premises of the argument, although relevant to the conclusion, are so weak and ineffective that relying on them is a blunder.

Argument from ignorance (*Argumentum ad Ignorantiam*)

Someone commits the fallacy argumentum ad ignorantiam if he or she argues that something is true because it has not been proved false, or false because it has not been proved true. Just because some proposition has not yet been proved false, one is not entitled to conclude that it is true. The same point can be made in reverse: If some proposition has not yet been proved true, one is not entitled to conclude that it is false. Many true propositions have not yet been proved true, of course, just as many false propositions have not yet been proved false. The fact that one cannot now be confident rarely serves as a good reason to assert knowledge of falsity, or of truth. Such an inference is defective; the fallacy is called the argument from ignorance, or the argument ad ignorantiam. Ignorance sometimes obliges us to suspend judgment, assigning neither truth nor falsity to the proposition in doubt.

Indian Context: This fallacy occurs when a person claims that something is true merely because it has not been proven false, or false because it has not been proven true. In the Indian context, such reasoning often appears in public debates, legal arguments, and administrative reasoning — for example, asserting that a scheme is effective because no complaints have been reported, or that a person is guilty simply because innocence has not been

proved. Indian jurisprudence, guided by the principle *"onus probandi incumbit ei qui dicit"* (the burden of proof lies on the claimant), discourages this reasoning; absence of evidence is not evidence of absence. Sound reasoning demands suspension of judgment until verifiable proof establishes either truth or falsity.

Appeal to inappropriate authority (*Argumentum ad Verecundiam*)

The *argument ad verecundiam* is committed when someone argues that a proposition is true because an expert in a given field has said that it is true. This fallacy is predicated upon the feeling of respect that people have for the famous. An expert's judgment constitutes no conclusive proof; experts disagree, and even when they are in agreement they may be wrong. However, reference to an authority in an area of competence may carry some weight, but it doesn't prove a conclusion. Ultimately, even experts need to rely upon empirical evidence and rational inference. The fallacy of the appeal to inappropriate authority arises when the appeal is made to parties who have no legitimate claim to authority in the matter at hand. Thus, in an argument about morality, an appeal to the opinions of Darwin, a towering authority in biology, would be fallacious, as would be an appeal to the opinions of a great artist such as Picasso to settle an economic dispute. Care must be taken in determining whose authority it is reasonable to rely on, and whose to reject. Although Picasso was not an economist, his judgment might plausibly be given some weight in a dispute pertaining to the economic value of an artistic masterpiece; and if the role of biology in moral questions were in dispute, Darwin might indeed be an appropriate authority. This is not to say that an authority in one field might not be correct when speaking outside his or her

area of expertise—to allege that would constitute a species of argumentum ad hominem circumstantial. In every instance, an argument must be judged upon its own merits. The most blatant examples of misplaced appeals to inappropriate authority appear in advertising "testimonials." We are urged to drive an automobile of a particular make because a famous golfer or tennis player affirms its superiority; we are urged to drink a beverage of a certain brand because some movie star or football coach expresses enthusiasm about it. Whenever the truth of some proposition is asserted on the basis of the authority of one who has no special competence in that sphere, the appeal to inappropriate authority is the fallacy committed. This appears to be a simple-minded mistake that is easy to avoid, but there are circumstances in which the fallacious appeal is tempting, and therefore intellectually dangerous.

Indian Context: This fallacy occurs when a claim is accepted as true merely because it is endorsed by a person of fame or influence rather than by a legitimate expert in the relevant field. In India, this is often seen in public discourse, political debates, or advertising, where film actors, cricketers, or spiritual leaders are cited as authorities on matters beyond their expertise—such as economics, health, or technology. Respect for prominence or social standing may lead people to confuse popularity with credibility.

For example, relying on a celebrity's statement to validate a government policy or a medical treatment constitutes an *appeal to inappropriate authority*. Expert opinion carries weight only when it comes from someone qualified in that field and supported by rational evidence or scientific reasoning. Ultimately, the merit of any argument must rest on facts and logic, not on the reputation or influence of those who assert it.

False cause (*Argument non Causa pro Causa*)

It is obvious that any reasoning that relies on treating as the cause of some thing or event what is not really its cause must be seriously mistaken. Often one is tempted to suppose, or led to suppose, that he understands some specific cause and effect relation when in fact he does not. The nature of the connection between cause and effect, and how one determine whether such a connection is present, are central problems of inductive logic and scientific method. Presuming the reality of a causal connection that does not really exist is a common mistake; in Latin the mistake is called the fallacy of non causa pro causa; called simply as the fallacy of false cause. Whether the causal connection alleged is indeed mistaken may sometimes be a matter for dispute. Some college faculty members, it has been argued, grade leniently because they fear that rigorous grading will cause lowered evaluations of them by their students and damage to their careers. Gradual "grade inflation" is said to be the result of this fear. It is sometimes mistakenly presumed that one event is caused by another because it follows that other closely in time. In primitive cultures such mistakes were common; the sun would invariably reappear after an eclipse if the drums had been beaten in the darkness, but we know that it is absurd to suppose that the beating of the drums was the cause of the sun's reappearance. Mere temporal succession does not establish a causal connection. This variety of false cause is called the fallacy of post hoc ergo propter hoc – "after this, therefore because of this." Even very sophisticated people sometimes commit this fallacy. Unusual weather conditions are blamed on some unrelated celestial phenomenon that happened to precede them; an infection really caused by a virus is thought to be caused by a chill wind, or wet feet, and so on.

Indian context: A false cause fallacy occurs when one assumes a causal link between two events that merely coincide in time or sequence. In India, this reasoning is often reflected in everyday beliefs and policymaking — for instance, attributing a good monsoon to a religious ritual, or blaming a rise in fuel prices on a political rally held the previous day. Such reasoning mistakes correlation for causation.

In social and administrative reasoning, this fallacy appears when outcomes (like low examination results or inflation) are linked to unrelated factors (such as a change in syllabus or government change) without sufficient evidence. Scientifically, mere succession or coincidence — "after this, therefore because of this" (*post hoc ergo propter hoc*) — is not proof of causation. A sound causal conclusion must rest on verifiable, empirical connection, not temporal or cultural association.

Hasty generalization

Throughout our lives, we rely on statements about how things generally are and how people generally behave. Nonetheless, general claims, although critical in reasoning, must be carefully scrutinized: The universality of their application ought never be accepted or assumed without justification. Hasty generalization is the fallacy we commit when we draw conclusions about all the persons or things in a given class on the basis of our knowledge about only one (or only a very few) of the members of that class. We all know of persons who have generalized mistakenly about certain companies or governments because of a single experience. Stereotypes about people who come from certain countries, or cultures, are widespread and commonly mistaken; hasty generalizations about foreign cultures can be downright nasty, and are good illustrations of the fallacious leap to broad

generalization on the basis of very little evidence. An anecdote or single instance may indeed be relevant support for a general rule or theory; but when it is treated as proof of that theory, the generalization is not well founded—the induction is defective. Here is an example: Eating deep fried foods tends to raise one's cholesterol level. A single instance in which it does not do so is hardly sufficient to show that such foods are healthy. The owner of a "fish and chips" shop in England fallaciously defended the healthfulness of his deep-fried cookery with this argument: Take my son, Martyn. He's been eating fish and chips his whole life, and he just had a cholesterol test, and his level is below the national average. What better proof could there be than a fryer's son?

Indian context: In reasoning, we often rely on general claims about how people or institutions behave, but such generalizations must rest on adequate evidence. A *hasty generalization* occurs when a conclusion is drawn about all members of a group based on very few or unrepresentative cases. For example, after facing delay at one government office, assuming *"all government offices are inefficient"* is a hasty generalization. Likewise, stereotyping entire communities, states, or professions based on isolated incidents—such as saying *"all lawyers are dishonest"* or *"all politicians are corrupt"*—illustrates this fallacy. Anecdotal evidence may support inquiry, but cannot prove a universal claim. Logical prudence demands that generalizations in public discourse, policymaking, or daily reasoning be supported by sufficient and representative facts.

2.12 Fallacies of presumption

Fallacies of presumption arise when an argument rests on unwarranted or hidden assumptions. The three main types

are: Accident, applying a general rule to exceptional cases where it does not fit; Complex question, framing a question that presupposes an unproven claim; and Begging the question (petitio principii), assuming in the premises what one seeks to prove, resulting in circular reasoning.

Nature of fallacy of presumption

Fallacies of presumption happen when too much is assumed in the premises and the inference to the conclusion depends mistakenly on these unwarranted assumptions.

In fallacious arguments of this kind the premises may indeed be relevant to the conclusion drawn, but that relevance is likely to flow from the tacit supposition of what has not been given support and may even be unsupportable. The presumption often goes unnoticed. To expose such a fallacy it is therefore usually sufficient to call attention to the smuggled assumption, or supposition, and to its doubtfulness or its falsity. Three common fallacies are included in this category.

Accident

Circumstances alter cases. A generalization that is largely true may not apply in a given case (or to some subcategory of cases) for good reasons. The reasons the generalization does not apply in those cases have to do with the special circumstances, also called the “accidental” circumstances, of that case or those cases. If these accidental circumstances are ignored, and we assume that the generalization applies universally, we commit the fallacy of accident. In the preceding section we explained the fallacy of converse accident, or hasty generalization, the mistake of moving carelessly or too quickly to a generalization that the evidence does not support. Accident is the fallacy that arises when we

move carelessly or unjustifiably from a generalization to some particulars that it does not in fact cover. Experience teaches us that even generalizations that are widely applicable and very useful are likely to have exceptions for which we must be on guard. For example, there is a general principle in law that hearsay evidence—statements made by a third party outside court—may not be accepted as evidence in court; this is the "hearsay rule," and it is a good rule. However, when the person whose oral communications are reported is dead, or when the party reporting the hearsay in court does so in conflict with his own best interest, that rule may not apply. Indeed, there is hardly any rule or general principle that does not have plausible exceptions, and we are likely to argue fallaciously if we reason on the supposition that some rule applies universally.

Complex question (*plurium interrogationum*)

One of the most common fallacies of presumption is to ask a question in such a way as to presuppose the truth of some conclusion that is buried in the question. The question itself is likely to be rhetorical, with no answer actually being sought. But putting the question seriously, thereby introducing its presupposition surreptitiously, often achieves the questioner's purpose—fallaciously. Thus an essayist recently asked: With all of the hysteria, all of the fear, all of the phony science, could it be that man-made global warming is the greatest hoax ever perpetrated on the American people? Such a statement assumes that much of the evidence supporting global warming is unreliable or "phony." The complex question is often a deceitful device. The speaker may pose some question, then answer it or strongly suggest the answer with the truth of the premise that had been buried in the question simply assumed.

Begging the question (*Petitio Principii*)

The fallacy called begging the question is widely misunderstood, partly because its name is misleading. It is the mistake of assuming the truth of what one seeks to prove. The "question" in a formal debate is the issue that is in dispute; to "beg" the question is to ask, or to suppose, that the very matter in controversy be conceded. This is an argument with no merit at all, of course, and one who makes such an assumption commits a gross fallacy. The Latin name of the fallacy, for which "begging the question" is the translation, is *petitio principii*, so each instance of it is called a *petitio*. One might think the fallacy would be so obvious that no one would ever commit it, but that is not the case. The logical mistake arises because it is obscured, even from its author, by the language used. Logician Richard Whately used this classic example of a deceptive *petitio*:

To allow every man unbounded freedom of speech must always be, on the whole, advantageous to the state; for it is highly conducive to the interests of the community that each individual should enjoy a liberty, perfectly unlimited, of expressing his sentiments.

This statement says only that freedom of speech is a good thing because it is a good thing—which is not much of an argument. In the effort to establish the desired conclusion, an author may cast about, searching for premises that will do the trick. Of course, the conclusion itself, reformulated in other words, will do the trick very nicely. The presumption that is the heart of the fallacy is buried in the verbiage of the premises, sometimes obscured by confusing or unrecognized synonyms. The arguments are circular—every *petitio* is a circular argument—but the circle that has been constructed may be large and confusing, and thus the

logical mistake goes unseen. Circular arguments are certainly fallacious, but the premises are not irrelevant to the conclusions drawn. They are relevant; indeed, they prove the conclusion, but they do so trivially—they end where they began. A *petitio principii* is always technically valid, but always worthless.

2.13 Fallacies of ambiguity

Fallacies of ambiguity occur when vagueness or shifting meanings distort reasoning. They include *equivocation*, where the same word is used in different senses; *amphiboly*, arising from ambiguous grammar or sentence structure; *accent*, caused by misleading emphasis or altered context; *composition*, where attributes of parts are wrongly ascribed to the whole; and *division*, where attributes of the whole are mistakenly applied to its parts. All these fallacies exploit linguistic or contextual ambiguity, leading to invalid or deceptive arguments.

Nature of fallacy of ambiguity

Fallacies of ambiguity happen when same word (term) carries one meaning in one part of the argument (say, a premise) and carries another meaning in another part (say, conclusion) of the same argument. This sometimes also called as “sophisms.”

Equivocation

Most words have more than one literal meaning, and most of the time we have no difficulty keeping those meanings separate by noting the context and using our good sense when reading and listening. Yet when we confuse the several meanings of a word or phrase—accidentally or deliberately—we are using the word equivocally. If we do that in the context of an argument, we commit the fallacy of equivocation. Sometimes the equivocation

is obvious and absurd and is used in a joking line or passage. Lewis Carroll's account of the adventures of Alice in Through the Looking-Glass is replete with clever and amusing equivocations. One of them goes like this:

"Who did you pass on the road?" the King went on, holding his hand out to the messenger for some hay. "Nobody," said the messenger. "Quite right," said the King; "this young lady saw him too. So of course Nobody walks slower than you."

The equivocation in this passage is rather subtle. As it is first used here, the word "nobody" simply means "no person" Reference is then made using a pronoun ("him"), as though that word ("nobody") had named a person. When subsequently the same word is capitalized and plainly used as a name ("Nobody"), it putatively names a person having a characteristic (being passed on the road) derived from the first use of the word. One kind of equivocation deserves special mention. This is the mistake that arises from the misuse of "relative" terms, which have different meanings in different contexts. For example, the word "tall" is a relative word; a tall man and a tall building are in quite different categories. A tall man is one who is taller than most men, a tall building is one that is taller than most buildings. Certain forms of argument that are valid for non relative terms break down when relative terms are substituted for them. The argument "an elephant is an animal; therefore a grey elephant is a grey animal" is perfectly valid. The word "grey" is a non relative term. In contrast, the argument "an elephant is an animal; therefore a small elephant is a small animal" is ridiculous. The point here is that "small" is a relative term: A small elephant is a very large animal. The fallacy is one of equivocation with respect to the relative term "small." Not all equivocation on relative terms is so

obvious, however. The word "good" is a relative term and is frequently equivocated on when it is argued, for example, that so-and-so is a good general and would therefore be a good president, or that someone is a good scholar and is therefore likely to be a good teacher.

Indian Context: Most words in Indian languages, like in English, carry multiple meanings depending on context. When a word or phrase is used in different senses within the same argument—intentionally or otherwise—it leads to the *fallacy of equivocation*. For example, the Hindi word *neta* may mean both "leader" and "politician"; if someone argues that "All leaders must be respected; therefore, every politician must be respected," the argument equivocates on the dual meaning of *neta*. Similarly, confusion arises from *relative* terms such as *small*, *big*, or *good*, whose meanings depend on context. A "small elephant" is still a large animal, and a "good lawyer" need not be a "good politician." The fallacy lies in treating context-dependent words as if they had fixed, universal meanings, thus producing deceptive or invalid reasoning.

Amphiboly

The fallacy of amphiboly occurs when one is arguing from premises whose formulations are ambiguous because of their grammatical construction. The word "amphiboly" is derived from the Greek, its meaning in essence being "two in a lump," or the "doubleness" of a lump. A statement is amphibolous when its meaning is indeterminate because of the loose or awkward way in which its words are combined. An amphibolous statement may be true in one interpretation and false in another. When it is stated as premise with the interpretation that makes it true, and a

conclusion is drawn from it on the interpretation that makes it false, then the fallacy of amphiboly has been committed.

Indian Context: The fallacy of amphiboly arises when an argument is based on a statement that is grammatically ambiguous or loosely constructed, leading to multiple possible interpretations. The term "amphiboly," from Greek meaning "double meaning," refers to confusion created by improper sentence structure rather than word choice. In Indian contexts—where official, legal, or administrative documents are often translated from Hindi or regional languages—this fallacy frequently occurs when unclear phrasing or misplaced punctuation allows two different readings of the same provision. For example, in legislative or contractual drafting, if a clause can be interpreted in two ways—one true and another misleading—the reasoning based on the misleading interpretation commits the fallacy of amphiboly.

Accent

We have seen that shifting the meaning of some term in an argument may result in a fallacy of ambiguity. Most commonly that shift is an equivocation, as noted earlier. Sometimes, however, the shift is the result of a change in emphasis on a single word or phrase, whose meaning does not change. When the premise of an argument relies on one possible emphasis, but a conclusion drawn from it relies on the meaning of the same words emphasized differently, the fallacy of accent has been committed. This fallacy can be very serious, and in argument it can be very damaging. Its name seems innocuous. This is due, in part, to the origin of the name in the classification of fallacies first presented by Aristotle. It happens that in the Greek language of Aristotle's day, some words spelled identically had different

meanings depending on the way in which they were pronounced, or accented. Those different meanings could result in a deceptive argument, appropriately called a fallacy of accent. In English today there are not very many cases in which changing the accent in a word changes the meaning of the word. Three of the most common are increase and increase, insult and insult, record and record. These pairs of words accented differently mean different parts of speech—one member of each pair is a noun, the other a verb—and thus it is unlikely that fallacious argument would now arise from those differently accented words. Over the centuries, however, while the Aristotelian name has been retained, it has come to be applied to a much wider category, which includes the misleading uses of emphasis in various forms and the use of meanings deliberately taken out of context. We are greatly stretching the name "accent" that Aristotle used. If we could overcome the weight of tradition, we might wisely rename the argument that misleads in this way "the fallacy of emphasis."

Indian Context: A *fallacy of accent* occurs when the same statement is given different meanings due to a shift in emphasis on certain words or phrases, though the words themselves remain unchanged. In India's multilingual context, this fallacy often arises not from pronunciation (as in classical Greek), but from *stress, tone, or selective emphasis* used in speech or writing to mislead or distort meaning. For example, a sentence like *"The Minister did not misuse the funds today"* may imply, depending on emphasis, that misuse occurred on another day. Similarly, quoting legal or constitutional provisions out of context, or highlighting selective words in a statute or judgment to support a misleading argument, are modern examples of the fallacy of accent in legal and political discourse. Thus, in Indian reasoning and debate, the fallacy of accent is better understood as a **fallacy**

of emphasis, where manipulation of tone, stress, or context alters the intended meaning.

Composition

The term fallacy of composition is applied to both of two closely related types of mistaken argument. The first may be described as reasoning fallaciously from the attributes of the parts of a whole to the attributes of the whole itself. A flagrant example is to argue that, because every part of a certain machine is light in weight, the machine "as a whole" is light in weight. The error here is manifest when we recognize that a very heavy machine may consist of a very large number of lightweight parts. Not all examples of fallacious composition are so obvious, however. Some are misleading. One may hear it seriously argued that, because each scene of a certain play is a model of artistic perfection, the play as a whole is artistically perfect. This is as much a fallacy of composition as to argue that, because every ship is ready for battle, the whole fleet must be ready for battle. The other type of composition fallacy is strictly parallel to that just described. Here, the fallacy is reasoning from attributes of the individual elements or members of a collection to attributes of the collection or totality of those elements. For example, it would be fallacious to argue that because a bus uses more gasoline than an automobile, all buses use more gasoline than all automobiles. This version of the fallacy of composition turns on a confusion between the "distributive" and the "collective" use of general terms.

Indian Context: The fallacy of composition arises when attributes of individual parts are wrongly assumed to apply to the whole. For instance, it would be fallacious to argue that because each state in India has a surplus in its budget, therefore the Union

of India must have a budget surplus; the total financial position depends on broader intergovernmental fiscal relations. Similarly, to argue that because each student in a class is intelligent, the class as a whole will perform brilliantly in national exams, is also fallacious. This error rests on confusing what is true *distributively* (of individual parts) with what is true *collectively* (of the whole). The reverse reasoning — from the whole to its parts — constitutes the fallacy of division.

Division

The fallacy of division is simply the reverse of the fallacy of composition. In it the same confusion is present, but the inference proceeds in the opposite direction. As in the case of composition, two varieties of the fallacy of division may be distinguished. The first kind of division consists of arguing fallaciously that what is true of a whole must also be true of its parts. To argue that, because a certain corporation is very important and Mr. Doe is an official of that corporation, therefore Mr. Doe is very important, is to commit the fallacy of division. This first variety of the division fallacy is committed in any such argument, as in moving from the premise that a certain machine is heavy, or complicated, or valuable, to the conclusion that this or any other part of the machine must be heavy, or complicated, or valuable. To argue that a student must have a large room because the room is located in a large dormitory would be still another instance of the first kind of fallacy of division. The second type of division fallacy is committed when one argues from the attributes of a collection of elements to the attributes of the elements themselves. To argue that, because university students study medicine, law, engineering, dentistry, and architecture, therefore each, or even any, university student

studies medicine, law, engineering, dentistry, and architecture is to commit the second kind of division fallacy. It is true that university students, collectively, study all these various subjects, but it is false that university students, distributively, do so. Instances of this fallacy of division often look like valid arguments, for what is true of a class distributively is certainly true of each and every member. Thus the argument Dogs are carnivorous. Afghan hounds are dogs. Therefore Afghan hounds are carnivorous, is perfectly valid. Closely resembling this argument is another, Dogs are frequently encountered in the streets. Afghan hounds are dogs. Therefore, Afghan hounds are frequently encountered in the streets.

Indian context: The fallacy of division is the reverse of the fallacy of composition and occurs when one wrongly infers that what is true of a whole must also be true of its individual parts. For example, to argue that because the Government of India is powerful, every government officer is powerful, would be a fallacy of division. Similarly, to assume that because a university is reputed, each of its departments must be equally excellent, is another instance. A second form of this fallacy arises when attributes of a collective group are wrongly attributed to each individual within it—for instance, reasoning that since Indian universities collectively offer courses in medicine, law, and engineering, each student must study all those subjects. While such arguments may appear valid, they confuse the collective truth of a group with the distributive truth about its individual members, leading to erroneous conclusions.