### Logical Reasoning

The aim of logic is to develop a system of methods and principles that we may use as criteria for evaluating the arguments of others and as guides in constructing arguments of our own. The aim is to determine that if the conclusion follows from the premise or not.

#### Statement

A statement is a sentence that is either true or false—in other words, typically a declarative sentence, hence, Truth and falsity are called the two possible truth values of a statement. Many sentences cannot be said to be either true or false. Questions, proposals, suggestions, commands, and exclamations usually cannot, and so are not usually classified as statements.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Truth Value</th>
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<tbody>
<tr>
<td>Melatonin helps relieve jet lag.</td>
<td>TRUE</td>
</tr>
<tr>
<td>Political candidates always tell the complete truth.</td>
<td>FALSE</td>
</tr>
<tr>
<td>Where is Khartoum?</td>
<td>QUESTION</td>
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<tr>
<td>Let's go to a movie tonight.</td>
<td>PROPOSAL</td>
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The premises are the statements that set forth the reasons or evidence, and the conclusion is the statement that the evidence is claimed to support or imply.

**Structure:**

- **P** so that is why **C**
- **P** since/for/because/as **C**

Tortured prisoners will say anything just to relieve the pain. Consequently, torture is not a reliable method of interrogation.

Expectant mothers should never use recreational drugs, since the use of these drugs can jeopardize the development of the fetus.

A syllogism, in general, is an argument consisting exactly two premises and one conclusion.

#### Inference

Further statements between premise and conclusion which translate premise into the conclusion.

#### Proposition

The meaning or information content of a statement. Contains argument and predicate (John likes Mary).

An implicit claim exists if there is an inferential relationship between the statements in a passage, but the passage contains no indicator words.

#### Types of Non-Arguments

One of the most important kinds of non-argument is the explanation. An explanation is an expression that purports to shed light on some event or phenomenon. Every explanation is composed of two distinct components.

**Explanations**

The explanandum (assertion) is the statement that describes the event or phenomenon to be explained, and the explanans (reason) is the statement or group of statements that purports to do the explaining.

#### Conditional Statements

A conditional statement is an “if . . . then . . .” statement; for example:

- If professional football games incite violence in the home, then the widespread approval given to this sport should be reconsidered.

Every conditional statement is made up of two component statements. The component statement immediately following the “if” is called the antecedent and the one following the “then” is called the consequent.
A deductive argument is an argument incorporating the claim that it is impossible for the conclusion to be false given that the premises are true. Additional deductive indicators are “certainly,” “absolutely,” and “definitely.”

On the other hand, an inductive argument is an argument incorporating the claim that it is improbable that the conclusion be false given that the premises are true. Additional inductive indicators are “improbable,” “plausible,” “implausible,” “likely,” “unlikely,” and “reasonable to conclude.” All inductive arguments depend on what philosophers call the uniformity of nature.

**Syllogisms**

A syllogism, in general, is an argument consisting of exactly two premises and one conclusion.

A categorical syllogism is a syllogism in which each statement begins with one of the words “all,” “no,” or “some.”

A hypothetical (conditional) syllogism is a syllogism having a conditional (“if...then”) statement for one or both of its premises.

A disjunctive syllogism is a syllogism having a disjunctive (“either...or...”) statement.

**Inductive argument forms**

A causal inference is an argument that proceeds from knowledge of a cause to a claim about an effect, or, conversely, from knowledge of an effect to a claim about a cause.

A prediction is an argument that proceeds from our knowledge of the past to a claim about the future.

An argument from analogy is an argument that depends on the existence of an analogy, or similarity, between two things or states of affairs. Because of the existence of this analogy, a certain condition that affects the better-known thing or situation is concluded to affect the similar, lesser-known thing or situation.

A generalization is an argument that proceeds from the knowledge of a selected sample to some claim about the whole group. Because the members of the sample have a certain characteristic, it is argued that all the members of the group have that same characteristic.
An argument from authority is an argument that concludes something is true because a presumed expert or witness has said that it is.

An argument based on signs is an argument that proceeds from the knowledge of a sign to a claim about the thing or situation that the sign symbolizes. The word “sign,” as it is used here, means any kind of message (usually visual) produced by an intelligent being.

A sound argument is a deductive argument that is valid and has all true premises. Both conditions must be met for an argument to be sound; if either is missing the argument is unsound.

A valid deductive argument is an argument in which it is impossible for the conclusion to be false given the premises are true. In these arguments the conclusion follows with strict necessity from the premises. Conversely, an invalid deductive argument is a deductive argument in which it is possible for the conclusion to be false given that the premises are true. In these arguments the conclusion does not follow with strict necessity from the premises, even though it is claimed to.

A cogent argument is an inductive argument that is strong and has all true premises. Also, the premises must be true in the sense of meeting the total evidence requirement. If any one of these conditions is missing, the argument is uncogent. Thus, an uncogent argument is an inductive argument that is weak, has one or more false premises, fails to meet the total evidence requirement, or any combination of these.

A strong inductive argument is an inductive argument in which it is improbable that the conclusion be false given that the premises are true. In such arguments the conclusion does in fact follow probably from the premises. Conversely, a weak inductive argument is an argument in which the conclusion does not follow probably from the premises, even though it is claimed to.

This barrel contains 100 apples.
Three apples selected at random were found to be ripe.
Therefore, probably all 100 apples are ripe.

This barrel contains 100 apples.
Eighty apples selected at random were found to be ripe.
Therefore, probably all 100 apples are ripe.

The first argument is weak and the second is strong. However, the first is not absolutely weak nor is the second absolutely strong.

A fallacy is a defect in an argument that arises from either a mistake in reasoning or the creation of an illusion that makes a bad argument appear good.

Both deductive and inductive arguments may contain fallacies; if they do, they are either unsound or uncogent, depending on the kind of argument. Conversely, if an argument is unsound or uncogent, it has one or more false premises or it contains a fallacy.
A formal fallacy is one that may be identified by merely examining the form or structure of an argument. Fallacies of this kind are found only in deductive arguments that have identifiable forms.

Informal fallacies are those that can be detected only by examining the content of the argument.

**categorical proposition.** A proposition that relates two classes, or categories, is called a categorical proposition.

The quality of a categorical proposition is either affirmative or negative depending on whether it affirms or denies class membership. Accordingly, “All S are P” and “Some S are P” have affirmative quality, and “No S are P” and “Some S are not P” have negative quality. These are called affirmative propositions and negative propositions, respectively.

The quantity of a categorical proposition is either universal or particular, depending on whether the statement makes a claim about every member or just some member of the class denoted by the subject term. “All S are P” and “No S are P” each assert something about every member of the S class and thus are universal propositions. “Some S are P” and “Some S are not P” assert something about one or more members of the S and hence are particular propositions.

The problem may be traced to the second premise. The letters C and B are interchanged, the form becomes valid, the original argument, with the same change introduced, also becomes valid (but unsound).

A chess player is a person. Therefore, a bad chess player is a bad person.

To detect this fallacy one must know that the meaning of the word “bad” depends on what it modifies, i.e., that being a bad chess player is quite different from being a bad person.

Consider the following example:

All members of the American Medical Association are people holding degrees from recognized academic institutions.

This standard-form categorical proposition is as follows:

- **quantifier:** all
- **subject term:** members of the American Medical Association
- **copula:** are
- **predicate term:** people holding degrees from recognized academic institutions

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The Traditional Square of Opposition

*In every mathematic text, shading an area of a Venn diagram indicates that the area is not empty. The significance of shading in logic is exactly the opposite.
• Contrary—when two statements can never be true at the same time at any cost
• Subalternation—when truth of other implies the truth of the other but not vice versa
• Contradictory (subalternation of contradictory)—when truth of one statement falsifies the other and vice versa

For example—relation of A to O and E to I as we can see in the validity table above if one is T then another one is false
• Subcontrary (subalternation of contradiction)—when two statements can never be false at any cost

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T/F=true false of statement given
• t/f=True false of conclusion
• d=doubtful

For example if given statement is A type and is b then the conclusion of type E would be false type I would be true and type O would be false

we may define definition as a group of words that assigns a meaning to some word or group of words. Accordingly, every definition consists of two parts: the definiendum and the definiens. The definiendum is the word or group of words that is supposed to be defined, and the definiens is the word or group of words that does the defining.

Stipulative Definitions
A stipulative definition assigns a meaning to a word for the first time. This may involve either coining a new word or giving a new meaning to an old word. The purpose of a stipulative definition is usually to replace a more complex expression with a simpler one. The need for a stipulative definition is often occasioned by some new phenomenon or development.

For example, many years ago lions were crossbred with tigers. The word “tigon” was selected to name the offspring of male tiger and a female lion, and “liger” was selected to name the offspring of a male lion and a female tiger. When a zebra was crossbred with donkey, the offspring was called a “zeedonk.”

Lexical Definitions
Dictionary definitions are all instances of lexical definitions. Thus, in contrast with a stipulative definition, which assigns a meaning to a word for the first time, a lexical definition may be true or false depending on whether it does or does not report the way a word is actually used.

Because words are frequently used in more than one way, lexical definitions have the further purpose of eliminating the ambiguity that would otherwise arise if one of these meanings were to be confused with another.

Light: 1. Something that makes things visible. 2. Electromagnetic radiation. 3. Of little weight. 4. Having fewer calories than the standard product.

Precising Definitions
The purpose of a precising definition is to reduce the vagueness of a word. Words such as “fresh,” “rich,” and “poor” are vague. Once the vagueness of such words is reduced by a precising definition, one can reach a decision as to the applicability of the word to a specific situation.

For example, if legislation were ever introduced direct financial assistance to the poor, a precising definition would have to supplied specifying exactly who is poor and who

The definition “Poor” means having an annual income less than $10,000 and a net worth of less than $20,000 is an example of a precising definition.
## Logical Reasoning

### Theoretical Definitions

A theoretical definition assigns a meaning to a word by suggesting a theory that gives a certain characterization to the entities that the term denotes. Such a definition provides a way of viewing or conceiving these entities that suggests deductive consequences, further investigation (experimental or otherwise), and whatever else would be entailed by the acceptance of a theory governing these entities.

The definition of the term "heat" found in texts dealing with the kinetic theory of heat provides a good example: "Heat means the energy associated with the random motion of the molecules of a substance definition does more than merely assign a mean; a word; it provides a way of conceiving the physical phenomenon that is heat.

### Persuasive Definitions

The purpose of a persuasive definition is to engender a favorable or unfavorable attitude toward what is denoted by the definiendum.

"Abortion" means the ruthless murdering of innocent children. (Persuasive)

"Abortion" means a safe and established surgical procedure whereby a woman is relieved of an unwanted burden. (Lexical)

### Extensional (Denotative) Definitions

An extensional (denotative) definition is one that assigns a meaning to a term by indicating the members of the class that the definiendum denotes. There are at least three ways of indicating the members of a class: pointing to them, naming them individually, and naming them in groups.

- Demonstrative (ostensive) definitions are probably the most primitive form of definition. All one need know to understand such a definition is the meaning of pointing.
- Enumerative definitions assign a meaning to a term by naming the members of the class the term denote.
- A definition by subclass assigns a meaning to a term by naming subclasses of the class denoted by the term.

- "Chair" means this and this and this—as you point to several chairs, one after the other.
- "Actress" means a person such as Nicole Kidman, Emma Thompson, or Natalie Portman.
- "Tree" means an oak, pine, elm, spruce, maple, a like.

### Intensional (Connotative) Definitions

An intensional definition is one that assigns a meaning to a word by indicating the qualities or attributes that the word connotes.

- A synonymous definition is one in which the definiens is a single word that connotes the same attributes as the definiendum.
- An etymological definition assigns a meaning to a word by disclosing the word's ancestry in both its own language and other languages.
- An operational definition assigns a meaning to a word by specifying certain experimental procedures that determine whether or not the word applies to a certain thing.

- "Physician" means doctor.
- For example, the English word "license" is derive the Latin verb licere, which means to be permitted.
- A solution is an "acid" if and only if litmus paper red when dipped into it.

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- **Deductive argument**-general to particular
  - Conclusion is the logical sequence of its premises
  - If premise is true conclusion will surely be true
  - A sound deductive argument is a valid argument whose conclusion follows from its premise(s), and the premise(s) of the argument are true.

- **Inductive argument**-particular to general
  - Premises support the conclusion but not entail it
  - A cogent inductive argument is when all premises are true
  - The conclusion conclusively follows from its premises.

- **Analogical argument**-An analogical argument is an argument in which one concludes that two things are alike in a certain respect because they are alike in other respects. Ex-earth is like other planets...

- **Circular argument**-a logical fallacy in which the reasoner begins with what they are trying to end with, Other ways to express this are that there is no reason to accept the premises unless one already believes the conclusion, or that the premises provide no independent ground or evidence for the conclusion.[2] Begging the question is closely related to circular reasoning. Ex- The reason there's such a big demand is because everyone wants to get in them

- **Statistical argument**-it qualifying words like "most", "frequently", "almost never", "rarely", etc. Or percentage or statistical data, or may have a statistical generalization as one or both of their premises.
  - For example: Almost all people are taller than 26 inches
  - Gareth is a person
  - Therefore, Gareth is almost certainly taller than 26 inches
  - Hypothetical argument - It means based mainly on a theory (or a guess) rather than being based on evidence. You see it used on lawyer/cop shows, when someone wants to explain what happened but doesn't want to admit guilt or participation. "Hypothetically, if I was there when Johnny got murdered, I might have seen Jake pull the trigger."
Types of sociological perspectives

- Deep ecology: Deep ecology is a contemporary ecological and environmental philosophy characterized by its advocacy of the inherent worth of living beings regardless of their instrumental utility to human needs, and advocacy for a radical restructuring of modern human societies in accordance with such ideas. Deep ecology argues that the natural world is a subtle balance of complex inter-relationships in which the existence of organisms is dependent on the existence of others within ecosystems. [1] Human interference with or destruction of the natural world poses a threat therefore not only to humans but to all organisms constituting the natural order.

- Essentialism: View that, for any specific entity (such as an animal, a group of people, a physical object, a concept), there is a set of attributes which are necessary to its identity and function; those properties that make the thing what it is, and without which it would be not that kind of thing.

- Feminism: Feminist perspective is to see things from the point-of-view of women. This is relevant to almost everything in a society driven by patriarchy, male chauvinism & male sexist bias.

- Realism: An inclination toward literal truth and pragmatism.