

# Notes on Logic

## Basics

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January 22, 2025

## 1 What Is Logic?

- The study of methods for evaluating arguments
- Statements and Propositions
  - Statement: A sentence that expresses a proposition
  - Proposition: The content or meaning of a (fully interpreted) statement
    - \* Two or more statements may express the same proposition.
      - Both “the moon orbits the earth” and “the earth is orbited by the moon” express the same proposition.
      - Both “Jesus is Lord” and “Kyrios Iēsous” express the same proposition, that Jesus is Lord
    - \* A single statement may have more than one meaning.
      - “I shot an elephant in my pajamas” (Groucho Marx in *Animal Crackers*).
  - Most of the time, I will use the two terms (statement and proposition) interchangeably.
- Truth value
  - The property of a proposition being either true or false
  - Statements express propositions
  - Questions, proposals, suggestions, commands, and exclamations do not express propositions.
  - Which of the following are statements?
    - \* Today is Tuesday.
    - \* What day of the week is it?
    - \* Please walk the dog.
    - \* If it is raining.
    - \* Mom said “If it is raining.”
    - \* Keep out!
    - \* Wet cement.
    - \* Ouch!
    - \* Murder is illegal.
    - \* Murder is wrong.
    - \* Yuck!
- Three fundamental laws of logic
  - The law of identity:  $p$  is  $p$
  - The law of noncontradiction: it is impossible that both  $p$  and not- $p$  are true
  - The law of excluded middle: either  $p$  is true or not- $p$  is true

## 2 What Is an Argument?

### 2.1 Arguments

- A set of statements where some of the statements, the premises, are used to support another statement, the conclusion.
- Premise
  - a statement intended to support the conclusion
- Conclusion
  - statement supported by the premise(s)
- Indicator words
  - Conclusion
    - \* consequently, thus, therefore, it follows that, as a result, hence, so, which means that
  - Premise
    - \* in view of the fact, because, assuming that, since, due to the fact that, inasmuch as, for

### 2.2 Non-Arguments

- Reports
- Opinions
- Illustrations
- Explanations
  - The sky appears blue from the earth's surface because light rays from the sun are scattered by particles in the atmosphere.
  - Explanans / Explicans
    - \* light rays from the sun are scattered by particles in the atmosphere.
  - Explanandum / Explicandum
    - \* The sky appears blue from the earth's surface
- Conditionals
  - If-then statements. The *if* part is called the antecedent. The *then* part is called the consequent.
    - \* If . . . then . . .
    - \* The antecedent is sufficient condition.
    - \* The consequent is the necessary condition.
  - Stylistic Variants
    - \* **if** it is raining, **then** the ground is wet  
if (antecedent), then (consequent)
    - \* the ground is wet **if** it is raining  
(consequent) if (antecedent)
    - \* **given that** it is raining, the ground is wet  
given that (antecedent), (consequent)
    - \* the ground is wet, **given that** it is raining  
(consequent), given that (antecedent)
    - \* it is raining **only if** the ground is wet  
(antecedent) only if (consequent)
  - a conditional is not an argument, but many arguments include conditionals. For example:
    - \* (P1) If it is raining, then the ground is wet.
    - \* (P2) The ground is not wet.
    - \* (C1) So, it is not raining.

## Reference

- Howard-Snyder, Frances, Daniel Howard-Snyder, and Ryan Wasserman. 2013. *The Power of Logic*. New York: McGraw-Hill.
- Pojman, Louis P. 2006. *Philosophy: The Pursuit of Wisdom*. 5th ed. Belmont, CA: Wadsworth.