Notes on Logic

Basics

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## 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: is
  + The law of noncontradiction: it is impossible that both and not- are true
  + The law of excluded middle: either is true or not- 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.