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: $p$ 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.