

CSI 30 LECTURE NOTES (Ojakian)

Topic 2: Quantifiers

OUTLINE

(References: 1.4, 1.5)

1. Predicates
 2. Universal and Existential Quantifiers
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1. Predicates

- (a) Limitations of propositional logic?
- (b) Consider some standard mathematical sentences. Examples:
 - i. For every number, adding 5 to it makes it larger.
 - ii. There is a number that you can add to 9 to get zero.
- (c) Predicate Examples.
 - i. $\text{EVEN}(x)$
 - ii. $\text{PRIME}(x)$
- (d) DEF: The *domain* of a predicate
- (e) Predicates with more than one argument
 - i. $\text{LivesIn}(P, B)$: New Yorker P lives in borough B
- (f) Predicates in Python: Use a function with just a single return statement
 - i. Do in range with inequality
 - ii. Do Even
 - iii. Can use connectives

2. Quantifiers

- (a) Universal
- (b) Existential
- (c) Examples
 - i. Translate logic to English. Section 1.4 (p. 56): 5
 - ii. Translate English to logic. Section 1.4 (p. 56, 57): 9
 - iii. Determine truth values. Section 1.4 (p. 57): 13 - 16
- (d) Use Python with a for-loop to check some values
 - i. Form: “for x in range(start, end)”
 - ii. Go up to but not include end

3. Multiple Quantifiers

- (a) Example: Commutativity
- (b) Translate to English. Section 1.5 (p. 68) 1, 3.
- (c) Translate to Logic. Section 1.5 (p. 69) 10.
- (d) Determine truth values. Section 1.5 (p. 71): 27, 28