

Logic and Computational Thinking Outline

- 1) Module 0: Introduction to the course
 - a) What this course is about
 - i) Analytic logic and its relation to computer science
 - ii) Critical thinking as both a lifestyle and aide to better programming and testing
 - iii) Note: This is not a programming course
 - b) Let's get started: critical thinking and logical reasoning
 - i) What does it mean to think critically?
 - ii) An overview of definition, induction, and deduction
 - iii) Computer programming and logical thinking
- 2) Module 1: Logic and Computer Science
 - a) Formal Logic and Computer Science
 - i) Introduction and prolegomena
 - ii) What is a Turing Machine?
 - iii) Bits and Bytes
 - iv) Algorithms
 - v) Logic and Computer Science
 - b) Introduction to Formal Logic
 - i) Introduction to Logic
 - ii) Arguments
 - iii) Statements
 - iv) Propositions
 - v) Truth Value
 - vi) Review Questions
 - c) Symbolizing and Logical Operators
 - i) Symbolization
 - ii) Introduction to Operators
 - iii) Negation Operator
 - iv) Conjunction Operator
 - v) Disjunction Operator
 - vi) Conditional Operator
 - vii) Sidebar: Operator of the largest scope
 - viii) Truth Tables
 - ix) Review Questions
- 3) Module 2: Deductive and Inductive Arguments
 - a) Types of arguments
 - i) Arguments again
 - ii) Review Questions
 - b) Deductive Arguments
 - i) Valid and invalid arguments
 - ii) Soundness

- iii) Sound deductive arguments
 - iv) First two deductive syllogisms
 - v) Sidebar: formal fallacies
 - vi) Two more deductive argument forms
 - vii) Deductive arguments and computer programs
 - viii) Review questions
- c) Inductive Arguments
 - i) Introduction to inductive arguments
 - ii) Strong and weak arguments
 - iii) Cogency
 - iv) Determining strength
 - v) Review questions
- 4) Module 3: Categorical Logic
 - a) Introduction to Categorical Logic
 - i) What is categorical logic?
 - ii) Aristotle's theory of forms
 - iii) Some, all, and none
 - iv) Quantity and quality
 - v) Review questions
 - b) Categorical form and syllogisms
 - i) Standard categorical form
 - ii) The categorical syllogism
 - iii) Forms of categorical syllogisms
 - iv) Review questions
 - c) Venn Diagrams
 - i) Categorical statements and validity
 - ii) Venn diagrams: I and O statements
 - iii) Venn diagrams: A and E statements
 - iv) Using Venn diagrams with categorical syllogisms
 - v) Venn diagrams: testing categorical syllogism for validity
 - vi) Review questions
- 5) Module 4: Introduction to Critical Thinking
 - a) What is Critical Thinking?
 - i) Introduction to critical thinking
 - ii) Socrates and critical thinking
 - iii) Socrates's definition of truth
 - iv) The Socratic Method
 - v) Two Socratic questions
 - vi) Applying the Socratic Method to computer science
 - b) Inductive Reasoning Applied
 - i) Forms of inductive reasoning
 - ii) The logic of science
 - iii) Confirmation and disconfirmation
 - iv) Mill's Method

- v) Mill's method: agreement
- vi) Mill's method: difference
- vii) Mill's method: variation
- c) A Case Study
- 6) Module 5: The Final Exam