

2 - LOGICAL AND ALGORITHMIC THINKING (Part 1)

Multiple Choice Questions:

1. *Which of the following best describes a philosophical argument?*

- a) A heated debate
- b) A chain of reasoning leading to a conclusion
- c) A disagreement between two people
- d) A physical altercation

2. *Which of the following is NOT a characteristic of a premise?*

- a) It can be true or false.
- b) It is a question.
- c) It is a statement.
- d) It has a truth value.

3. *What is the main difference between deductive and inductive arguments?*

- a) Deductive arguments are longer.
- b) Inductive arguments are more common.
- c) Deductive arguments offer more certainty.
- d) Inductive arguments are easier to construct.

4. *Which of the following is an example of a deductive argument failing due to a false premise?*

- a) All cats are mammals. My pet is a cat. Therefore, my pet is a reptile.
- b) All birds can fly. Penguins are birds. Therefore, penguins can fly.
- c) The sky is blue. I see a blue object. Therefore, the object is the sky.
- d) All squares have four sides. This shape has four sides. Therefore, this shape is a square.

5. *Which of the following is a characteristic of inductive reasoning?*

- a) The conclusion is always true if the premises are true.
- b) It deals with probabilities.

- c) It is the strongest form of reasoning.
- d) It is used when knowledge is neat and tidy.

6. *What is Boolean logic primarily used for in the context of computers?*

- a) Dealing with shades of gray
- b) Making logical decisions based on true/false values
- c) Performing statistical analysis
- d) Understanding natural language

7. *Which of the following statements is NOT a good Boolean proposition?*

- a) The car is red.
- b) The temperature is above 25 degrees Celsius.
- c) It is beautiful.
- d) The light switch is on.

8. *What does the logical operator "AND" require for a compound proposition to be true?*

- a) At least one of the propositions to be true.
- b) All of the propositions to be true.
- c) None of the propositions to be true.
- d) Only the first proposition to be true.

9. *Which logical operator flips the truth value of a proposition?*

- a) AND
- b) OR
- c) NOT
- d) IMPLIES

10. *What does the "IMPLIES" operator indicate?*

- a) Causation
- b) Correlation
- c) Equality
- d) Probability

11. Which operator indicates a two-way dependency, where both propositions are linked without exception?

- a) IMPLIES
- b) AND
- c) OR
- d) IF AND ONLY IF

True/False Questions:

1. Logic is primarily concerned with arguments in the sense of disagreements between people.
2. A premise is a question.
3. Deductive arguments are stronger than inductive arguments in terms of certainty.
4. A deductive argument with false premises can still be valid.
5. In inductive reasoning, the conclusion is always guaranteed to be true if the premises are true.
6. Computers are inherently better at dealing with inductive reasoning than deductive reasoning.
7. Boolean logic deals with statements that can have levels of certainty.
8. A Boolean proposition can be both true and false at the same time.
9. The statement "It is hot" is a good example of a Boolean proposition.
10. In Boolean logic, "AND" requires that at least one of the connected propositions is true for the compound proposition to be true.
11. "NOT" is a logical operator that combines two propositions.
12. Implication means causation.
13. The biconditional operator means that the second proposition is influenced solely by the first.

True/False:

1. Symbolic logic aims to reduce ambiguity and increase precision in logical reasoning.
2. Natural language is always precise and unambiguous, making symbolic logic unnecessary.
3. The word "or" always has the same meaning in natural language.
4. Symbolic logic uses symbols to represent propositions and operators.
5. Using symbols in logic makes it harder to treat propositions as variables.

Multiple Choice:

1. What is the main benefit of using symbolic logic?

- a) It makes logical arguments longer and more detailed.
- b) It reduces ambiguity and makes reasoning clearer.
- c) It makes logic more difficult to understand.
- d) It eliminates the need for logical operators.

2. Which of the following is a reason why natural language can be problematic in logic?

- a) It is always very precise.
- b) The same word can have different meanings in different contexts.
- c) It is easy to translate into symbols.
- d) It is always unambiguous.

3. In symbolic logic, what do symbols typically represent?

- a) Numbers
- b) Propositions and operators
- c) Emotions
- d) Colors

4. If P represents "The cat is black" and Q represents "The cat is fluffy," which of the following could represent "The cat is black and fluffy" in symbolic logic (assuming a common convention)?

- a) $P \rightarrow Q$
- b) $P \vee Q$
- c) $P \wedge Q$
- d) $\sim P$

5. What is the advantage of treating propositions as variables in symbolic logic?

- a) It makes the arguments more confusing.
- b) It allows us to manipulate and evaluate them more easily.
- c) It makes them less like mathematical expressions.
- d) It makes them harder to understand.

KEYS

TRUE/FALSE

1. False
2. False
3. True
4. False
5. False
6. False
7. False
8. False
9. False
10. False
11. False
12. False
13. True

MULTIPLE CHOICE

1. b) A chain of reasoning leading to a conclusion
2. b) It is a question.
3. c) Deductive arguments offer more certainty.
4. a) All cats are mammals. ¹ My pet is a cat. Therefore, my pet is a reptile.
5. b) It deals with probabilities.
6. b) Making logical decisions based on true/false values
7. c) It is beautiful.
8. b) All of the propositions to be true.
9. c) NOT
10. b) Correlation
11. d) IF AND ONLY IF

TRUE/FALSE

1. True
2. False
3. False
4. True
5. False

MULTIPLE CHOICE

- b) It reduces ambiguity and makes reasoning clearer.
- b) The same word can have different meanings in different contexts.
- b) Propositions and operators
- c) $P \wedge Q$ (This typically represents "P and Q". Other symbols like & or • might also be used depending on the specific system of symbolic logic.)
- b) It allows us to manipulate and evaluate them more easily.

Understanding the Text

1. What is the primary purpose of the passage?
2. How does the passage define an "argument" in the context of logical reasoning?
3. What are the two main categories of logical arguments mentioned in the text?
4. Why is deductive reasoning considered the strongest form of reasoning?
5. What are two ways in which a deductive argument can fail?

Critical Thinking

6. The passage states that "computers are not well equipped to deal with shades of grey." What does this mean in terms of logical reasoning?
7. Why is inductive reasoning more commonly used in real-life situations than deductive reasoning?
8. How does Boolean logic help computers make decisions?
9. What is the function of logical operators in reasoning? Provide an example from the text.

10. Explain the difference between the "IMPLIES" and "IF AND ONLY IF" operators using your own examples.

Application and Analysis

11. Consider the following statement: "If I study every day and review my notes, then I will pass the exam." Identify the premises and conclusion, and explain whether this reasoning is deductive or inductive.
12. How would you express the statement "If the shop is open and it is before 6 PM, then I can buy groceries" using symbolic logic?
13. The text provides an example of a faulty deductive argument using the statement: "The Earth is round. A tennis ball is round. Therefore, the Earth is a tennis ball." Create your own example of a faulty deductive argument.
14. How could Boolean logic be applied to a simple decision-making scenario, such as deciding whether to go outside?
15. In what ways do truth tables help clarify logical reasoning? Provide an example.