

Logic: An Introduction

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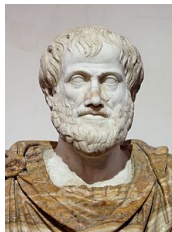
What is logic?

Logic is the **Science of Reasoning**

- Etymology: *Logykos* (Greek) - pertaining to reasoning
- Logic = The science of reasoning, proof, thinking, or inference
- Logic = The fundamental science of thoughts and its categories
- Logic = The science or art of reasoning as applied to a department of knowledge
- Logic = The analysis and appraisal of arguments
- We all do logic when we try to clarify reasoning and separate good from bad reasoning

History of logic

Aristotle (384-322 B.C) developed a general system of logic intended to incorporate the basic principles of good reasoning, and to provide a way to evaluate specific cases of reasoning.



- Predecessors of Aristotle, in the Greek world and elsewhere, were interested in reasoning well – in offering cogent arguments for their theses and theories, and identifying flaws and fallacies in their own and other's reasoning.
- However, Aristotle appears to be the first person to offer the outlines of a comprehensive systems for codifying and evaluating a very wide range of arguments and reasoning.

History of logic

- A **syllogism** (Greek: syllogismos = "conclusion," "inference") is a kind of **logical argument** in which one proposition (the conclusion) is inferred from two or more others (the premises) of a specific form.
- The following is an example of an Aristotelian syllogism

All humans are mortal.

Socrates is human.

Socrates is mortal

- The horizontal line separates the premises from the conclusion
- This syllogism is an example of good reasoning - constitutes a good argument - because it is truth-preserving.
- If the first two sentences (premises) are true, then the third sentence (conclusion) must also be true.

Why study logic?

- Most people find logic enjoyable
 - Doing logic is like playing a game or doing a puzzle
 - Logic will challenge your reasoning process in new ways
 - The rigour of logical systems will likely fascinate you
- Logic improves your general powers of analytical thinking
 - You have been reasoning about things all your life
 - This may be the first time that you will try to understand what reasoning is and become better at it
 - A person who thinks clearly has a big advantage, whether in or out of school
- Logic is fundamental to **Computer Science**

Applications of logic to computer science

- The underpinnings of all electronic computers are **logic gates**
- Minimization of the number of components of electronic circuits
- **Artificial Intelligence**
- The programming language **PROLOG** (PROgramming with LOGic)
- DNA Computing