Philosophical Logic: PHI455

Week1: Basics

A. V. Ravishankar Sarma

07 June, 2021

Indian Institute of Technology Kanpur

About the Course

Basic Concepts of Logic: Propositional Logic

Tree Method as a decision procedure method

Puzzles

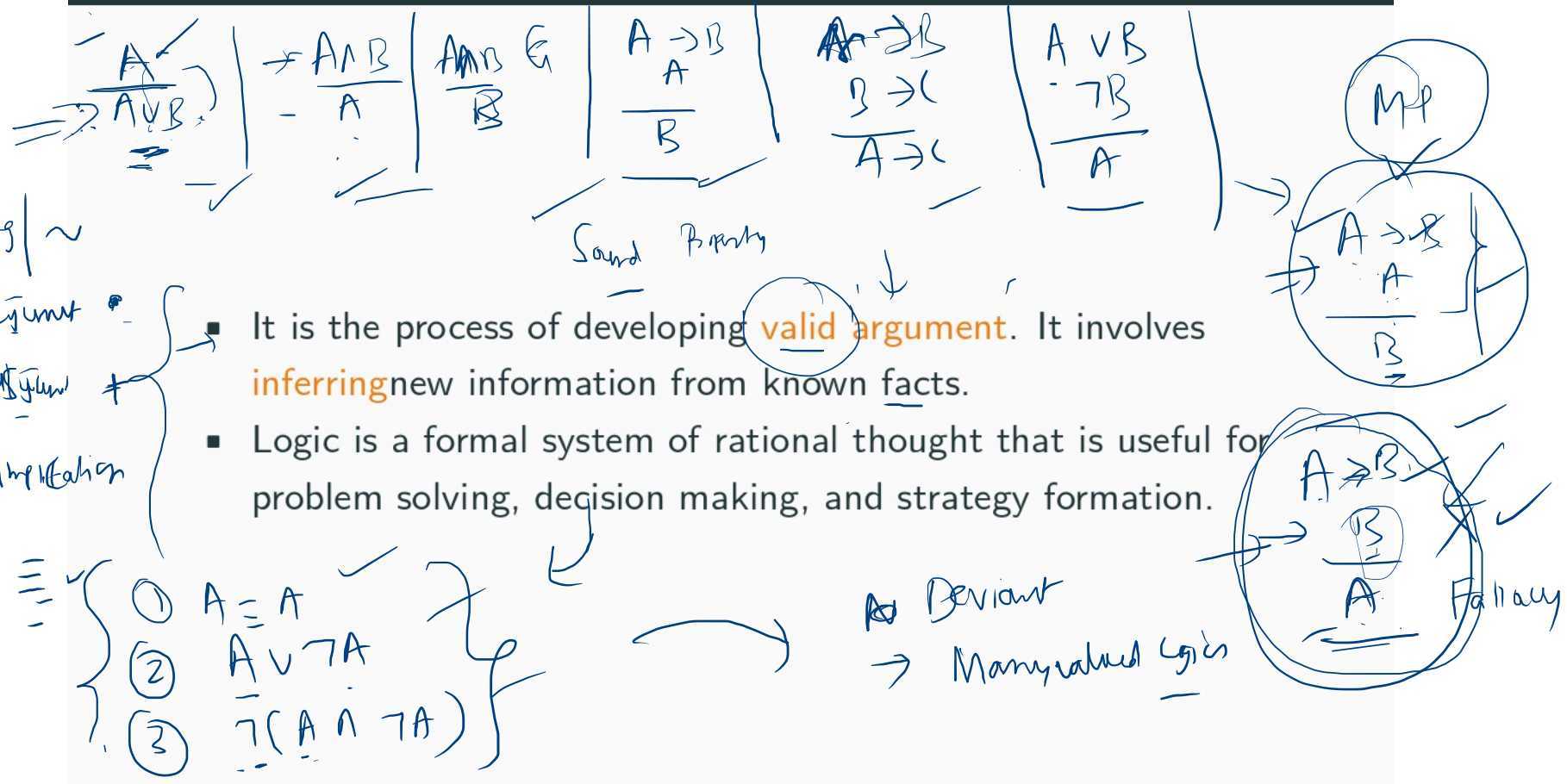
References

About the Course

PHI455:

- See FCH
- Syllabus: Propositional Logic, possibility and Paadox
- Midsem+EndSem+Term Paper
- True/False questions and Muliple choice questions
- 7 Weeks: 7 Assignments

What is Logic?



- It is the process of developing valid argument. It involves inferringnew information from known facts.
- Logic is a formal system of rational thought that is useful for problem solving, decision making, and strategy formation.

How this term is used:

- Not everything follows the rules of logic.
- The logic behind this statement is faulty.
- There's no logic in his argument.
-

Patrick Hurley

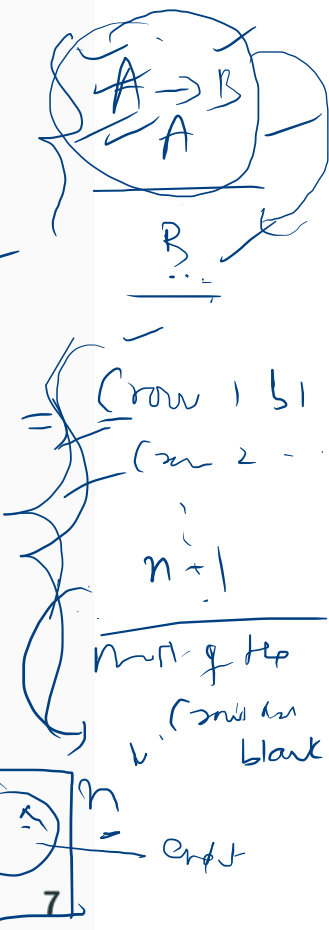
Concise Introduction to Logic

Reasoning:

- Process of thinking about things in logical and rational way.
- Innate human ability- formalized by 'Logic, Mathematics, AI.
- Formal, Informal, top-down, bottom-up
- It's a stupid decision that completely defies logic.
- I can't fault you on your logic.
- What's the logic of your argument?
- I don't follow the logic of your argument.
- The logic behind this statement is faulty.

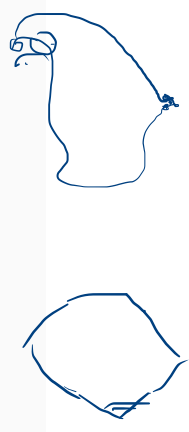
Types of reasoning:

- Deductive: General to particular- it produces logically certain results.
- Inductive reasoning: It seels theories to explain observations (bottom=up)- uncertain but likely results.
- Abduction: it allows for best guesses. Used in diagnosis, troubleshooting.
- Backward Induction: It starts with theories or end states and works backwards to explain them. Example: Working backward to evaluate moves.
- Critical Thinking: Process of rational thought that seeks to draw conclusions in an objective, through and informed manner. Influenced by context, culture, base don natural language.



Other kinds of Reasoning:

- Counterfactual thinking: Considering things that are known to be contrary-to-fact (impossible). How past actions influence present and future actions.
- Intuition: Judgements that are made by the mind that are perceived by the unconscious. Process by which they are generated is not well-understood. It played a significant role in the scientific discovery.



Intelligence, Rationality

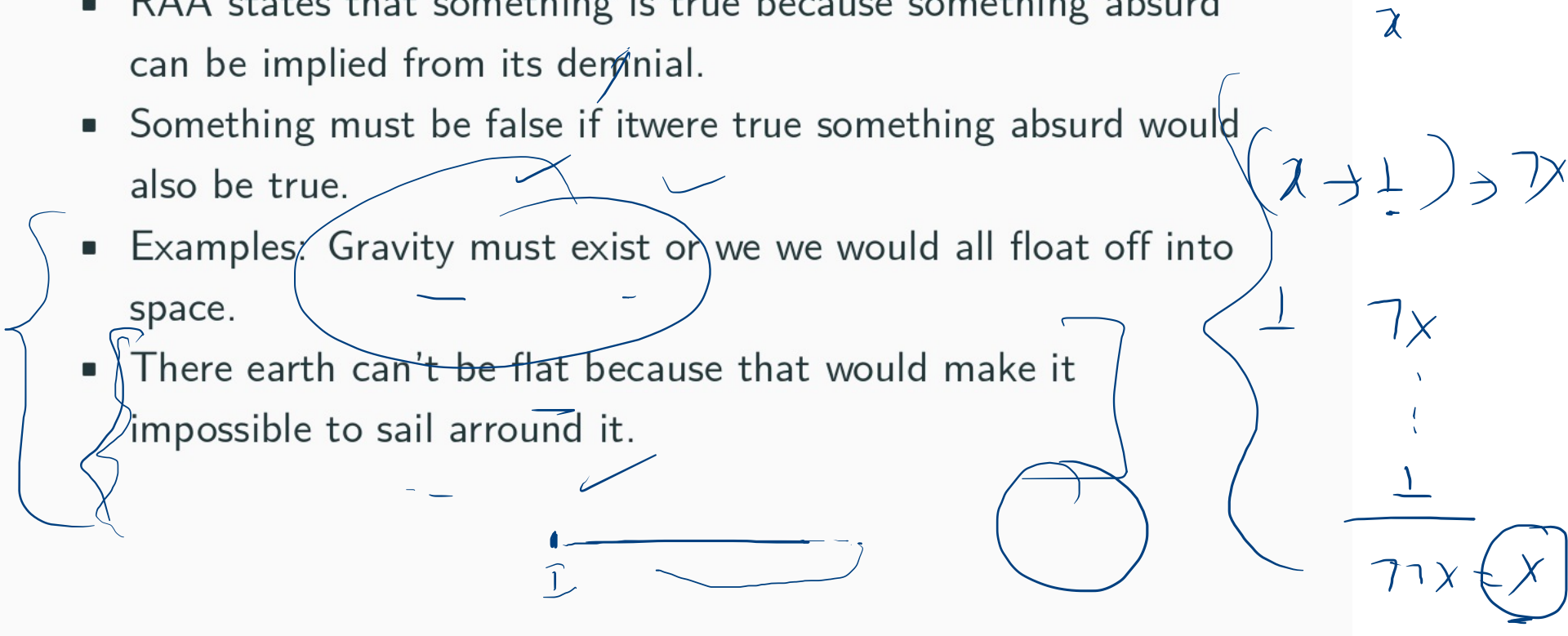
- Intelligence: It is an ability of depth and variation that includes creativity, reasoning, understanding, abstraction, conceptual thinking, systems thinking, emotional intelligence, logic.
- Rationality: Rational thought is a state of being reasonable that can be judged by other humans. Human beings are rational animals.
- Rational thought is often somewhat logical, but it also includes factors such as, emotions, culture, language, and social conventions.

Classical Logic:

- Allows for only two truth values: 0, 1
- Ex: it is false that Glass is full and false that glass is empty.
- Classical logic is widely used in proving theorems, Solve problems, and taking decisions.
- Strength: Correctness
- Fuzzy logic: Allows partial truths: 0.3 full and 0.7 empty.
- It allows infinite degrees of truth.

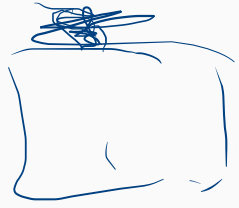
Reductio ad absurdum:

- RAA states that something is true because something absurd can be implied from its denial.
- Something must be false if itwere true something absurd would also be true.
- Examples: Gravity must exist or we we would all float off into space.
- There earth can't be flat because that would make it impossible to sail arround it.



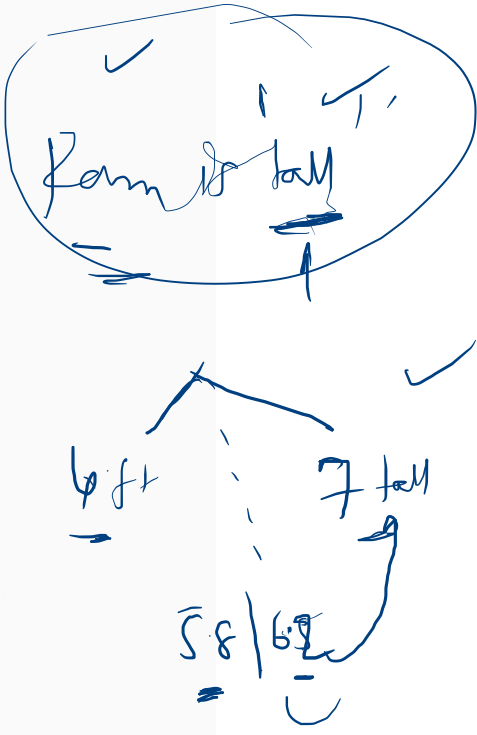
Law of Excluded Middle, Priciple of bivalence

- Aristotle: Any proposition is true or its negation is true.
- It cannot handle degrees of truth.
- Principle of bivalence: Every proposition has exactone truth value, either true or false.



4 limits of Clasical logic:

- Partial truths
- Language: ~~fail~~ in case of Vaguness, fail to capture the subtleties of natural language.
- Uncertainty: Real world decision making is dependent on reasoning with uncertainity and incomplete information. Commonsense reasoning is non-monotonic
- Perceptions: Aesthetics, metaphors, emotions and cultural concepts. Ex: Write a movie review using formal logic.



Basic Concepts of Logic: Propositional Logic

Tree Method as a decision procedure method

Puzzles

References

References

- Key terms: https://simplicable.com/
-