

# ARGUMENTS

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The main subject of logic

# Truth-Preservation

- A method of reasoning is truth-preserving if it never takes one from truths to a falsehood.
- Deductive reasoning (when done properly) is truth-preserving.
- Truth: While notions of truth are controversial in philosophy, for the purposes of this course 'true' will refer to what is the case, and 'false' will refer to what is not the case.

# The bearers of truth: Propositions

- A proposition is a single thing that could or could not be the case. (that is, it bears a *truth-value*)
- For example, the sentence “The girl carries water” expresses the proposition that *the girl carries water*, which is true when the girl carries water and false otherwise.
- Note that the sentence “Puella aquam portat” *means* the same thing as above because it *expresses the same proposition*.
- If one sentence expresses a truth, so does the other, because it is the proposition that both sentences express that is true.

# Propositions

- Not all sentences express propositions; some kinds of sentences do not.
  - To express a proposition, a sentence must be meaningful in a language.
  - “He got juju eyeball he one holy roller” expresses no proposition because it is not meaningful
  - “Socrates is a prime number” is more problematic. It may express a proposition that is meaningful but false, or it may express no proposition at all due to its being meaningless.

# Propositions

- Not all sentences express propositions; some kinds of sentences do not.
  - The sentence must also express something that could be the case.
  - “Close the door” is an imperative, and does not assert anything about the world
  - “Is the door open?” is a question, and also does not assert anything about the world
  - Likewise “Hooray.”

# Propositions

- A sentence that expresses a proposition is called truth-evaluable because the proposition that it expresses can be evaluated as to its truth or falsity at any given time.
- A sentence that does not express a proposition is not truth-evaluable.

# Bearers of truth-value

- Since propositions are expressed by sentences that are meaningful, they reflect **states of affairs**. In other words, they reflect the way things are or are not.
- Take the proposition expressed by the sentence 'John is tall'.
- The proposition is true if it is considered in a state of affairs in which John is tall and it is false if it is considered in a state of affairs in which John is not tall.
- Notice that whether we **agree** about the state of affairs is a different question.

# Uncertainty and Disagreement

- Consider: “Abraham Lincoln sneezed four times on his 21<sup>st</sup> birthday”
  - Well, either he did or he didn't so the sentence expresses a proposition that is true or false even if nobody knows whether it is true or false.
  - Everyone believes at least one thing that is false. What is true or false is independent of what is thought to be true or false.



# Uncertainty and Disagreement

- Consider: “Eating meat is immoral”
  - Either the predicate ‘is immoral’ is true of the subject ‘eating meat’ or it is not.
  - People may forever disagree about the truth or falsity of the proposition expressed by the sentence, but nobody’s opinions decide the matter.

# The two most basic principles:

- Non-contradiction: No proposition is both true and false at the same time.
- Excluded Middle: Every proposition is either true or false.

# Arguments

- An argument is a set of statements designed to justify a further statement.
- The statement being justified is known as the conclusion.
- The statements doing the justifying are known as the premises.
- Premises and conclusion must all express propositions.

# Standard Form

- An argument presented in the following format is considered to be presented in standard form:
  - Premise 1
  - Premise 2
  - ...

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  - Conclusion
- Formal logic is called formal because it primarily treats *forms* of arguments as opposed to particular arguments.

# Argument Forms

- Consider the argument:
  - If it is raining, then the ground is wet
  - It is raining

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  - The ground is wet
- This argument's *form* is as follows:
  - If R then W
  - R

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  - W

P1: IF



THEN



P2:



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C:



# Validity

- Any argument form that is always truth-preserving is called a valid argument form. Any argument form that is not valid is called invalid.
- The previous argument form (known as Modus Ponens) is a valid argument form.
- Now consider the argument:
  - If Neal Stephenson wrote the Bible, then Neal Stephenson is a great author.
  - Neal Stephenson wrote the Bible.

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  - Neal Stephenson is a great author.
- Is this argument truth preserving?

# Soundness

- Yes, the previous argument is truth-preserving. We can identify it as having the form known as Modus Ponens.
- That an argument is of a truth-preserving form is not a guarantee that it is true. IF the premises were true, then the conclusion would preserve that truth.
- A sound argument is one that is valid, *and* whose premises are true.
- We will not examine soundness to any great extent. Logic is most concerned with determining which argument forms are valid.