


Jordan Stewart-Rozema
PHIL 110 – 002
Aug 28, 2014

INTRODUCTION TO LOGIC

WHAT IS LOGIC?

- **From Greek “Logos” – word, speech, reason, account**
 - **Generally, the study of reasoning.**
 - **Gensler: “the analysis and appraisal of arguments” (p.1)**
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WELL WHAT IS AN ARGUMENT?

If Jordan is on time for her 9AM logic class, then she must have had coffee.

Jordan was here on time.

**Premises
(also called
Propositions)**

Jordan must have had coffee.

Conclusion

(Yes, I did.)

OTHER EXAMPLES...

Anyone who studies hard will do well on the quiz.

Suzie studied hard.

Suzie did well on the quiz.

Pink textbooks are the coolest textbooks.

This textbook is pink.

This textbook is cool.

If you don't understand something, you should ask a question.

If you don't ask a question, then I assume you understand it!



PHILOSOPHERS DEFINE LOGIC:

Logic is “the science of the forms of thoughts.”

– C.S. Peirce (1839-1914), *“The Logical and Psychological Treatment of Metaphysics”*

“To discover truths is the task of all sciences; it falls to logic to discern the laws of truth.”

– Gottlob Frege (1848-1925), *“The Thought: A Logical Inquiry,” Mind Vol. 65.*

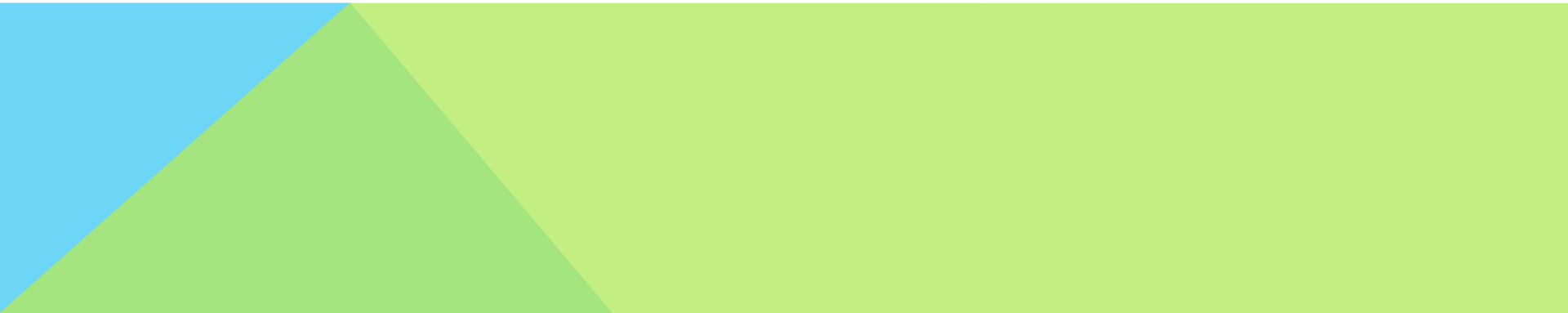
Logic is “the name of a discipline which analyzes the meaning of the concepts common to all the sciences, and establishes the general laws governing the concepts.”

– Alfred Tarski (1901-1983), *from Introduction to Logic and to the Methodology of Deductive Sciences*

Kant’s (1724-1804) definition of Logic: See Handout

What do all of the definitions we just read seem to emphasize?

What is missing from our original account of logic as the study of reasoning or arguments?



NON-PHILOSOPHERS (I HOPE) DEFINE LOGIC:

Systematic thinking process of coming to the best solution, which somehow seems to evade most parents.

Something that makes Vulcans sexually aroused. Vulcans usually raise an eyebrow and look at their superior officers suggestively when they find something logical.

– Urban Dictionary



WHAT DOES IT MEAN TO BE CORRECT?

Logic studies the principles of *correct* reasoning. How we ought to reason if we want to reason well.

In logic, there are several terms that relate to something being correct:

**VALIDITY
TRUTH
SOUNDNESS**

The one that we will talk about most is...



VALIDITY

If an argument is valid, that means:

It is impossible for its premises to be true and its conclusion false.

The premises *entail* the conclusion, or, they guarantee the truth of the conclusion if they themselves are true.

Classic Example:

All men are mortal.

Socrates is a man.

Therefore, Socrates is mortal.

Invalid Argument:

All men are mortal.

Socrates is mortal.

Therefore, Socrates is a man.

TRUTH

Take Note:

A VALID argument need not have true premises.

Take the following:

All who study philosophy are famous.

Jordan studies philosophy.

Therefore, Jordan is famous.

When determining VALIDITY, we are concerned only with the FORM of the argument.

If all its premises were true, would the conclusion have to be true?

SOUNDNESS

An argument is SOUND when:

It is VALID and its premises are all TRUE.

Example:

The Eiffel Tower is in Paris.

Paris is in France.

Therefore, the Eiffel Tower is in France.

DIFFERENT TYPES OF LOGIC

Informal Logic:

Studies reasoning and arguments in “natural” or “ordinary” language.

Formal Logic:

What we will mostly be looking at. Uses abstract rules of inference to derive conclusions from premises and to determine the validity of arguments. (This system can be called a “logical calculus.”)

Also called Symbolic Logic, because it uses a symbolic rather than natural language.



DEDUCTION VS. INDUCTION

Deduction:

When the conclusion of an argument follows from its premises with NECESSITY.

Moves from general to particular.

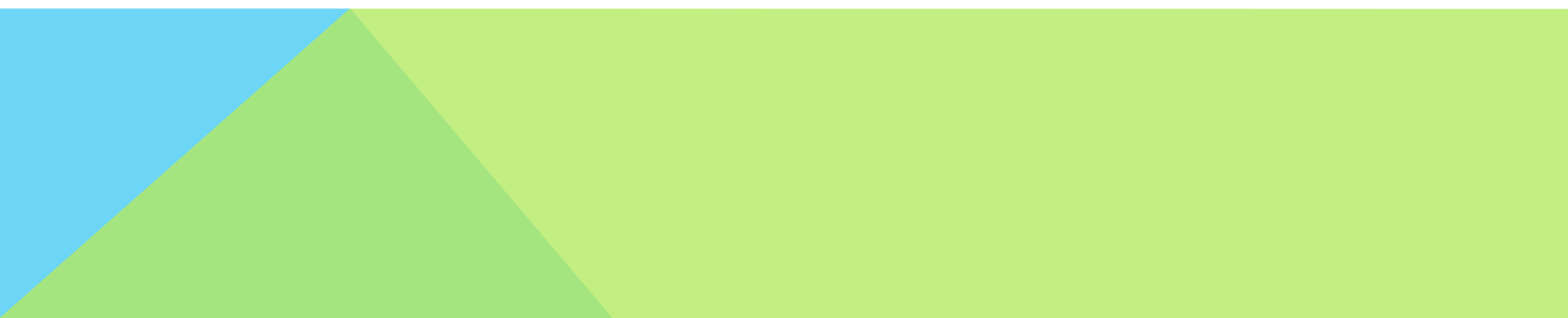
Usually associated with FORMAL logic.

Induction:

When the conclusion of an argument follows from its premises with PROBABILITY.

Moves from particular to general.

Usually associated with INFORMAL logic.



INDUCTION

Inductive arguments cannot be VALID or SOUND. They seek to provide good evidence for the conclusion, but cannot guarantee its certainty like deductive arguments can.

Inductive arguments are instead:

**STRONG – If the truth of the premises would make the conclusion probable.
(Corresponds to validity.)**

COGENT – If the truth of the premises would make the conclusion probable, and the premises are in fact true. (Corresponds to soundness.)



INDUCTIVE EXAMPLES

Strong Argument:

All life that we know of depends on water for its existence.

Therefore, if we discover a new life form, it probably will depend on water too.

Classic (Weak) Argument:

All of the swans we have seen are white.

Therefore, all swans are white.

EXCEPTIONALLY STRONG Argument:

ESPN's Future Power Rankings named the Seahawks the best-positioned team in the NFL for success over the next three seasons.

The Seahawks had a successful draft pick this year and locked in long-term contracts for some of its best players.

It is likely that they will win another Super Bowl.



<https://www.youtube.com/watch?v=7rVAKfMK-Hs>