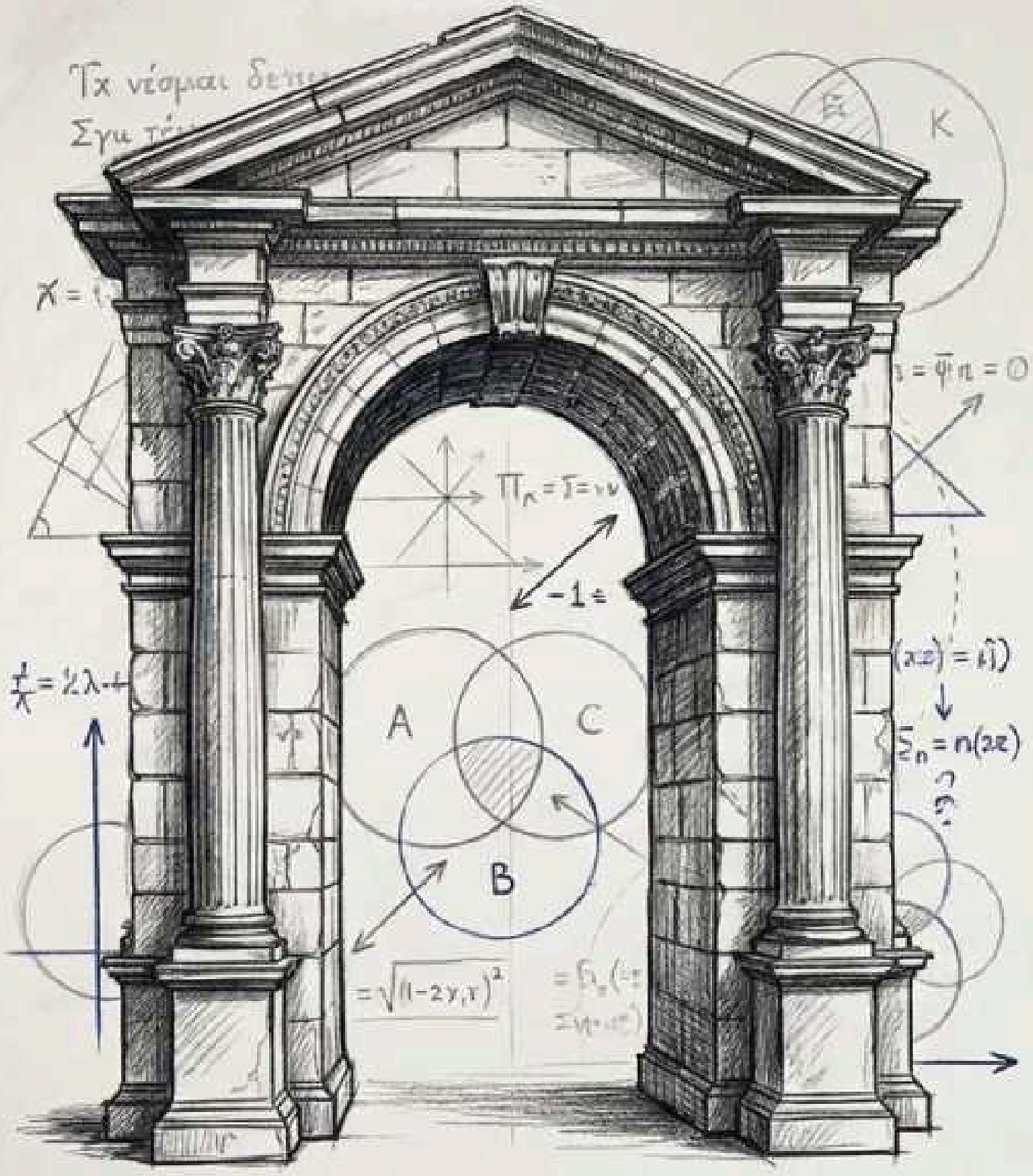


¶ 3.1

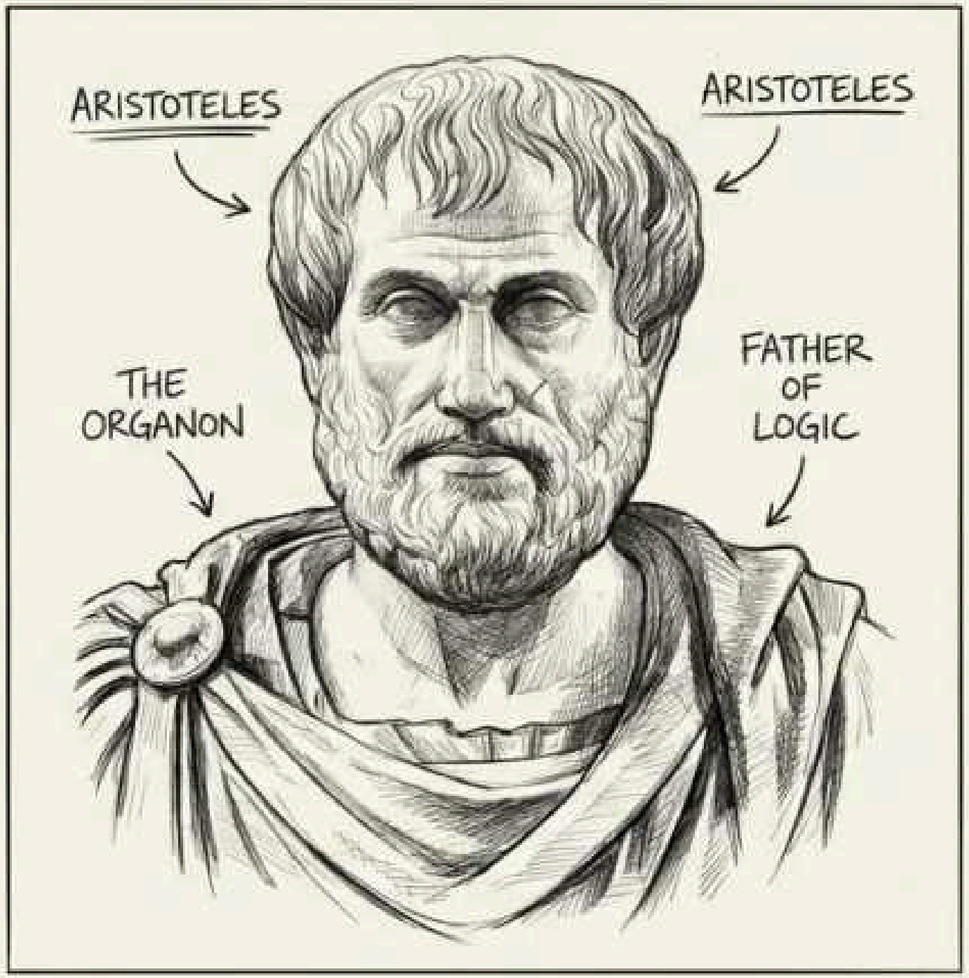
Lecture 3: The Syllogism

Categorical statements, structural validity, and classical rules.

Gemini Notebook

The First Great System of Logic.

¶ 3.2





For two millennia, the syllogism was synonymous with logic itself. It remains the finest way to learn how form dictates validity.

Gemini Notebook

The Anatomy of a Categorical Syllogism.

¶ 3.3

1. Premise: All humans are mortal.
2. Premise: All Greeks are humans.
3. Conclusion: Therefore, all Greeks are mortal.

Exactly 3 statements.
Exactly 3 categories.
Each category appears twice.

Gemini Notebook

The Four Standard Forms.

¶ 3.4

	Affirmative	Negative
Universal	Universal Affirmative: All S are P	Universal Negative: No S are P
Particular	Particular Affirmative: Some S are P	Particular Negative: Some S are not P

Everything in the system is built from these four.

Gemini Notebook

The Medieval Shorthand.

¶ 3.5

	Affirmative	Negative
Universal	Universal Affirmative: All S are P	Universal Negative: No S are P
Particular	Particular Affirmative: Some S are P	Particular Negative: Some S are not P

Affirmo (*I affirm*)

Nego (*I deny*)

A convenient shorthand that gives the system its famous memory aids.

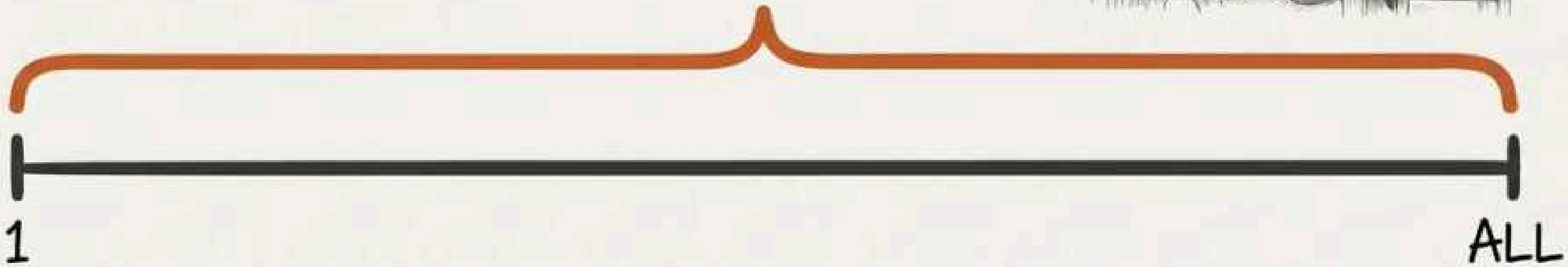
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The Logical Meaning of ‘Some’.

¶ 3.6



Some = $1 \leq x \leq$ ALL



Everyday language misleads.
“Some students passed” does not rule out that all passed.

Some = a ~~maximum~~.

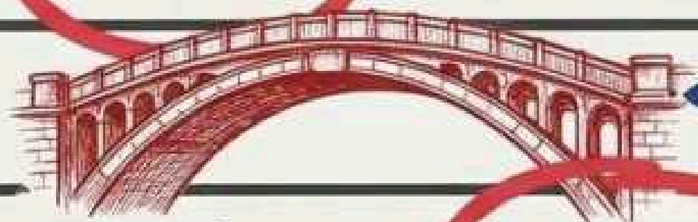
Some = a minimum ✓
(at least one, possibly all).

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The Three Terms.

¶ 3.7

Premise 1: All humans are mortal.



Premise 2: All Greeks are humans.

The Middle Term.
Connects the premises.
Never appears in the conclusion.

Conclusion: Therefore, all Greeks are mortal.

Subject Term

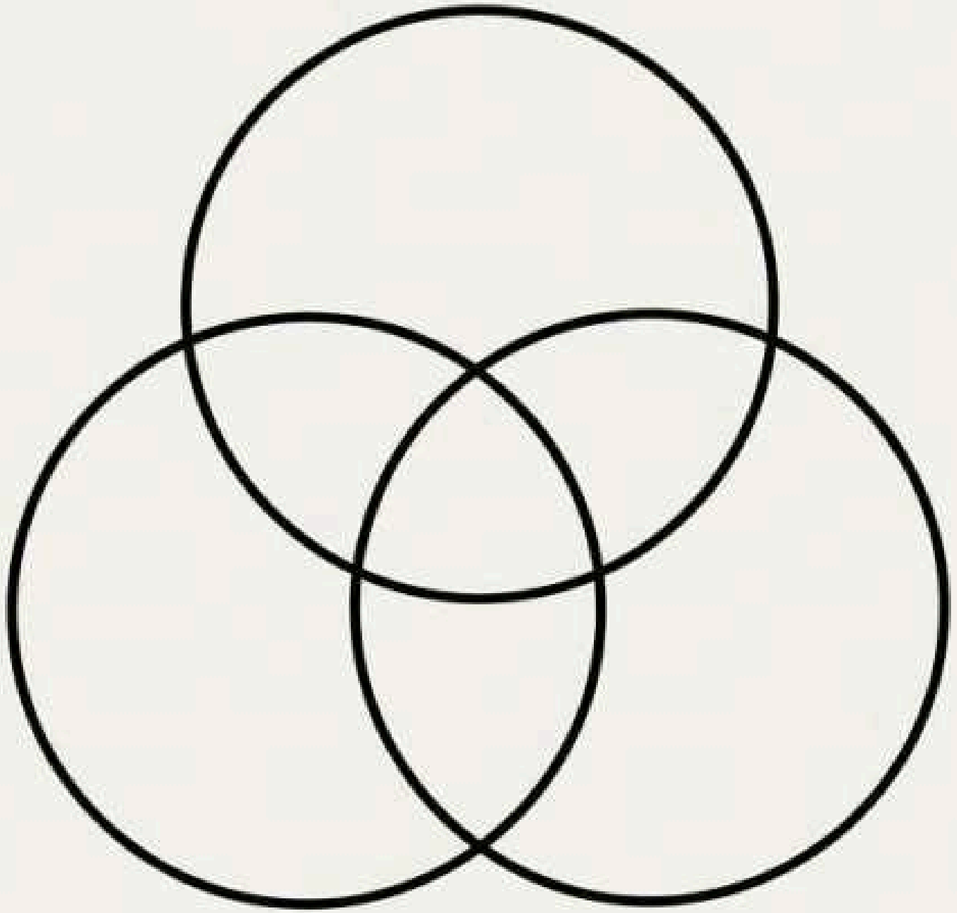
Predicate Term

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Checking Syllogisms via Visual Proof.

¶ 3.8

1. Draw the two premises.
2. Look: does the conclusion already appear in the picture?



Legend	
	Empty Region.
	Something is here.

If yes = Valid. If no = Invalid.

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Visualizing Validity

¶ 3.9

- All Greeks are humans (Inner circle inside middle).
- All humans are mortal (Middle circle inside outer).



Validity is visible: The Greeks circle lies entirely inside the mortal circle.

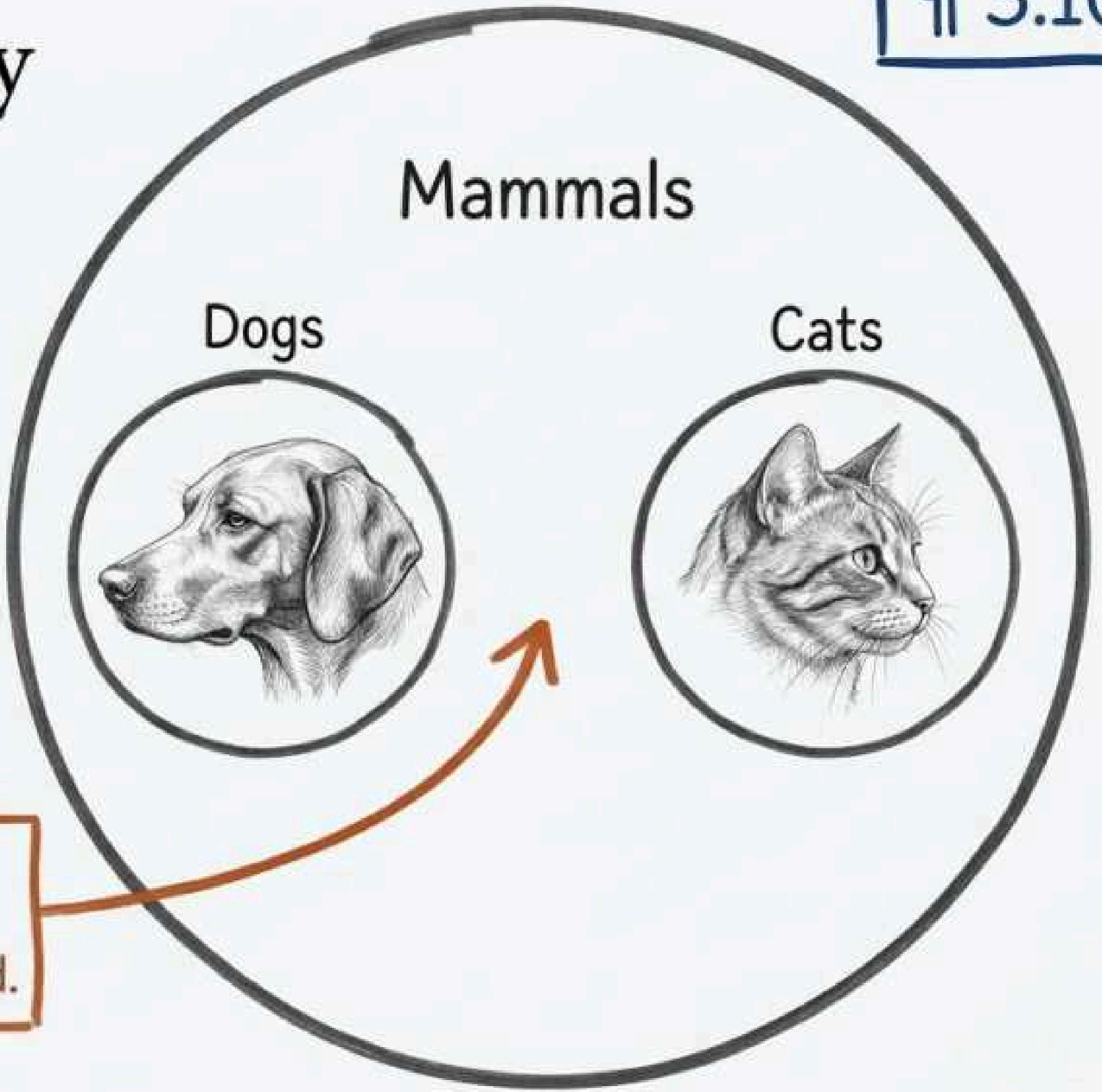
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¶ 3.10

Visualizing Invalidity

Premise 1: All dogs are mammals.
Premise 2: All cats are mammals.

Conclusion: Therefore, all dogs are cats.



Both circles sit inside mammals,
but nothing forces them to overlap.
True premises, false conclusion = Invalid.

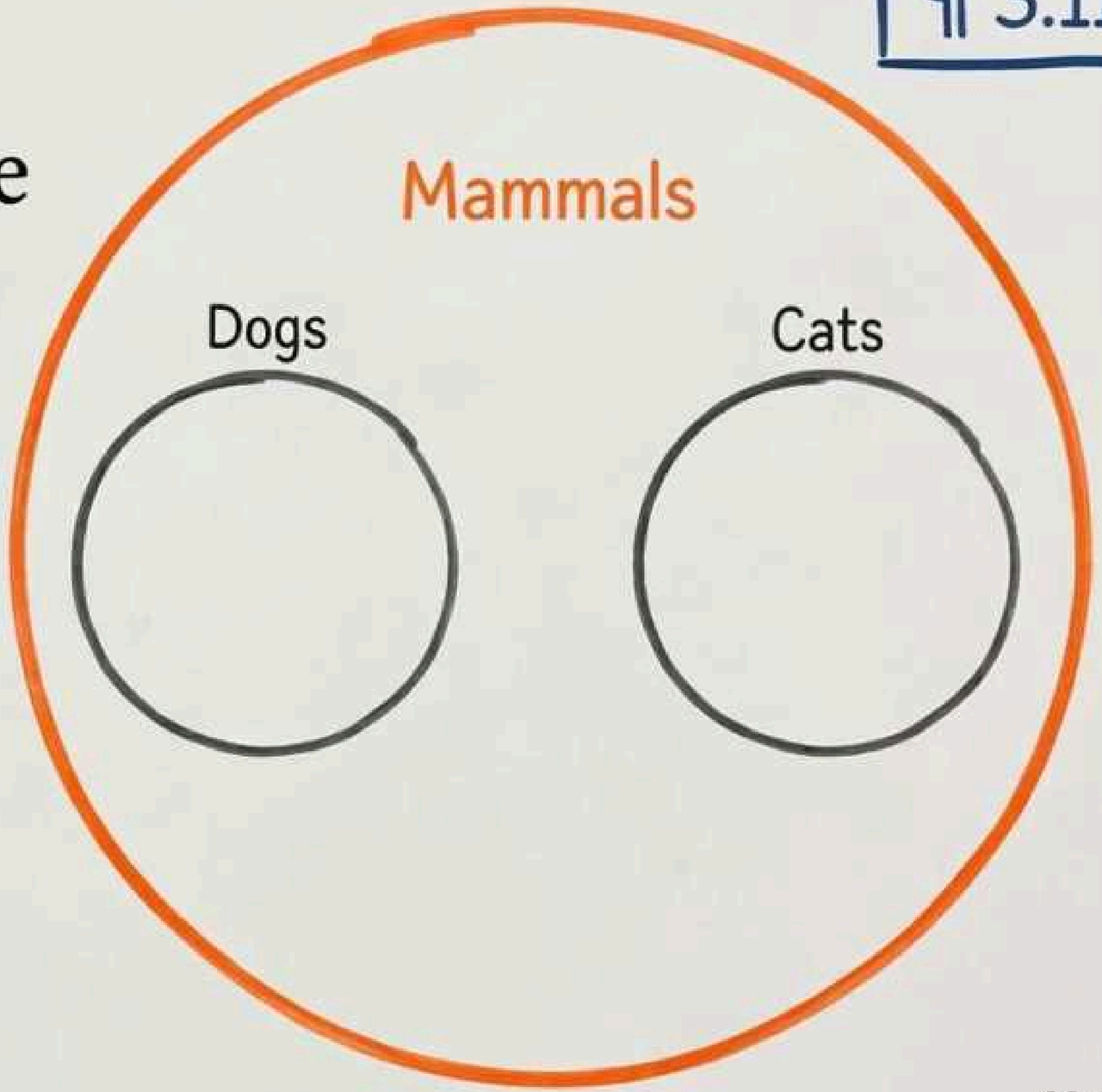
Gemini Notebook

¶ 3.11

The Fallacy of the Undistributed Middle

The middle term (Mammals) is never fully covered (distributed) by either premise.

- Dogs and cats lie inside mammals.
- But mammals do not lie entirely inside dogs or cats.
- Result: The two subject categories remain completely unconnected.

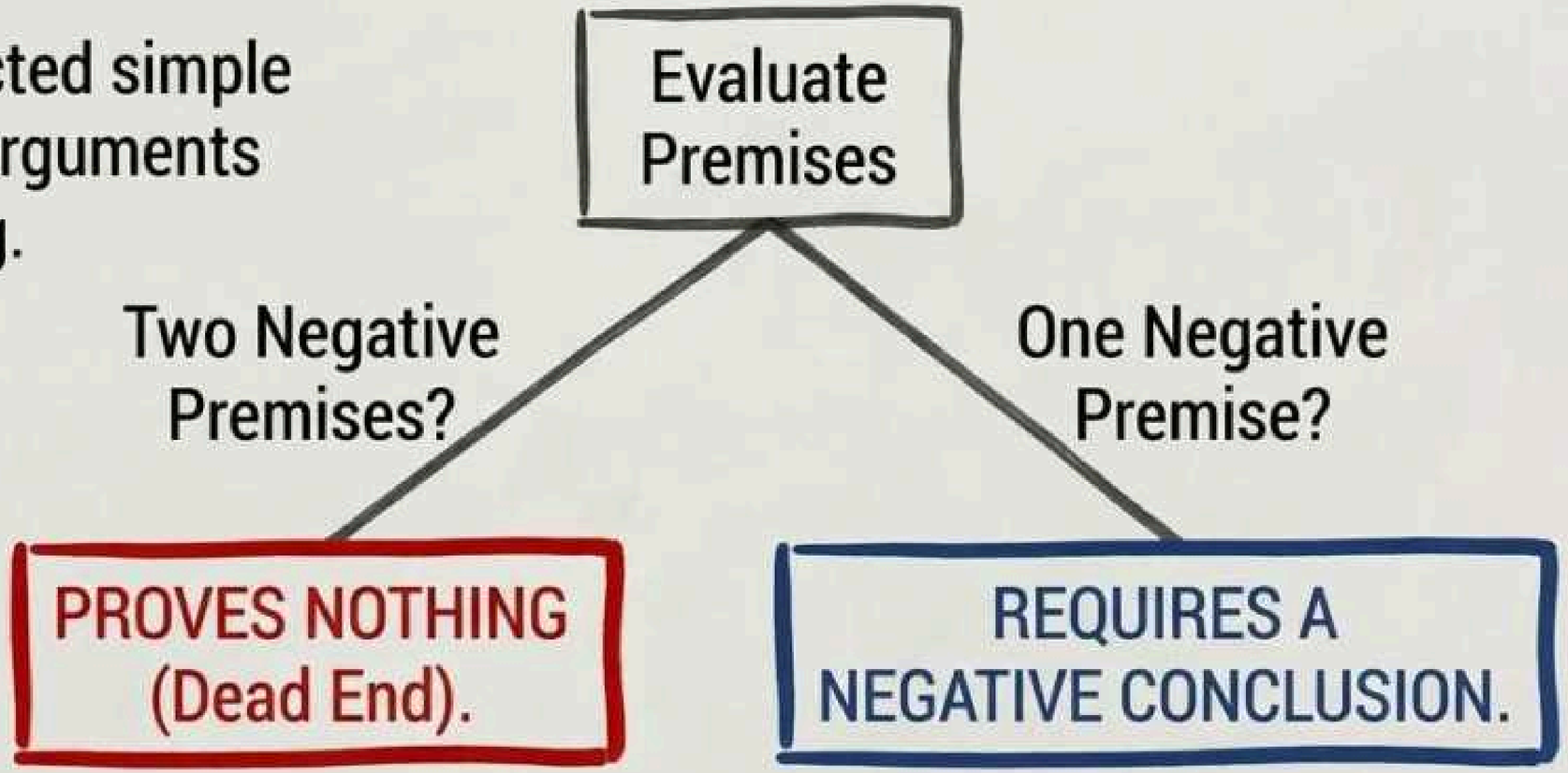


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¶ 3.12

Classical Rules: Negatives.

Logicians collected simple rules to check arguments without drawing.



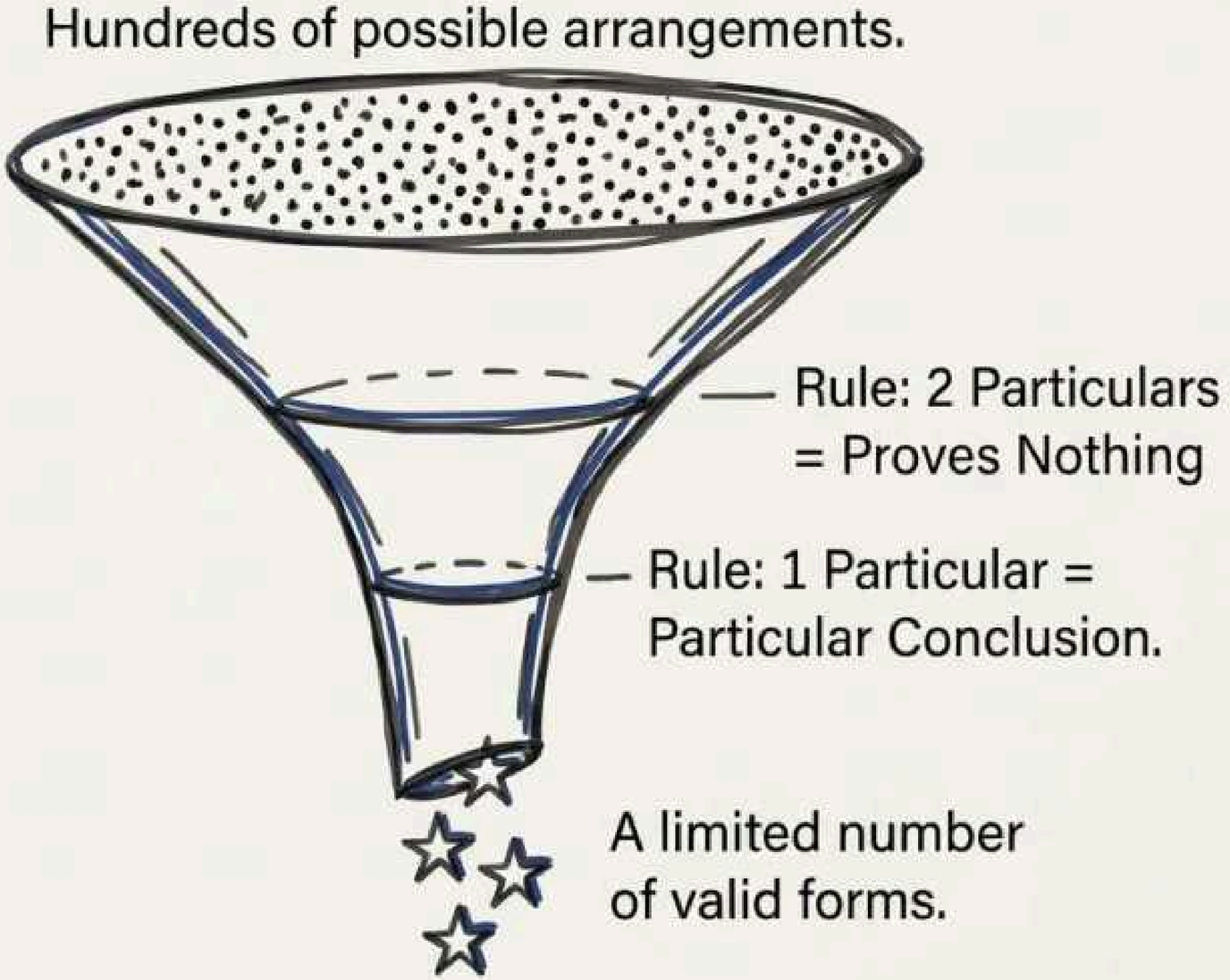
A conclusion can never claim more than its premises provide.

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Classical Rules: Particulars.

¶ 3.13

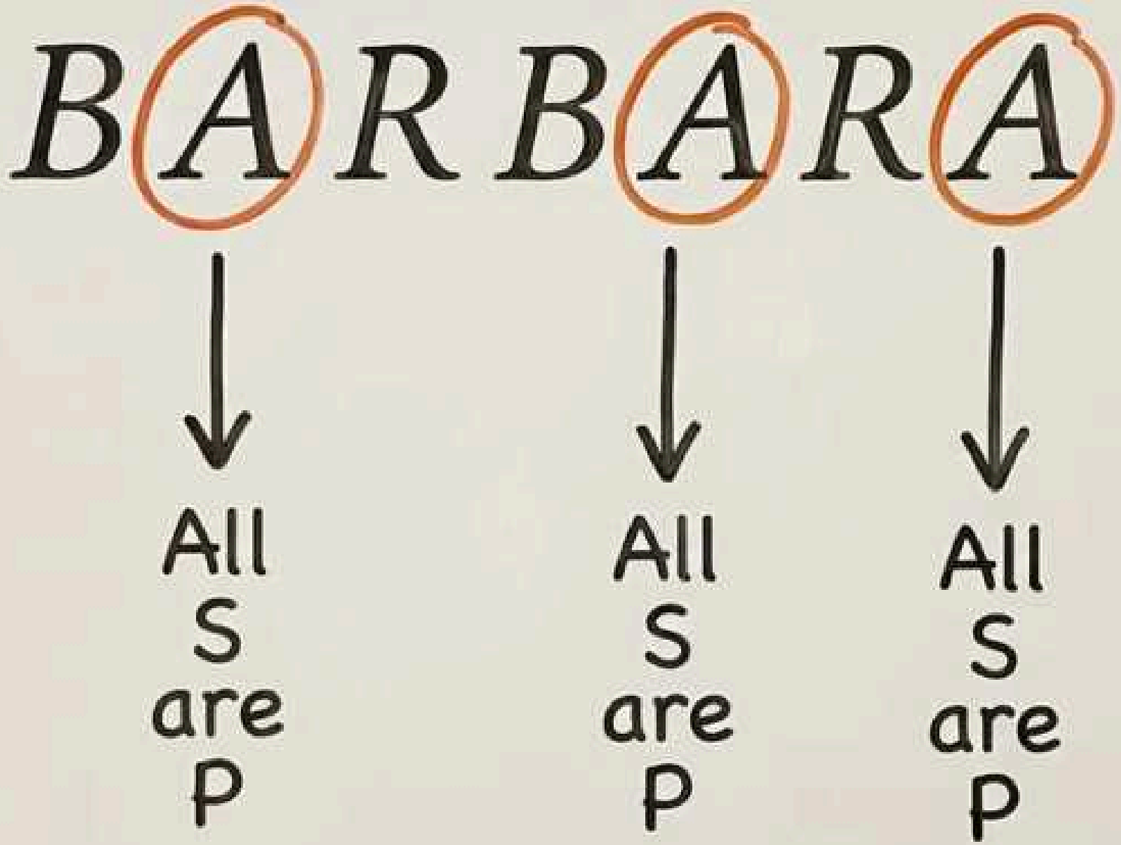
If some dogs are brown, and some brown things are fast, we know nothing definitive about fast dogs.



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The Craft of Logic: Medieval Mnemonics.

¶ 3.14



Names like Barbara, Celarent, Darii, and Ferio aren't random. The vowels spell out the forms of the three statements.

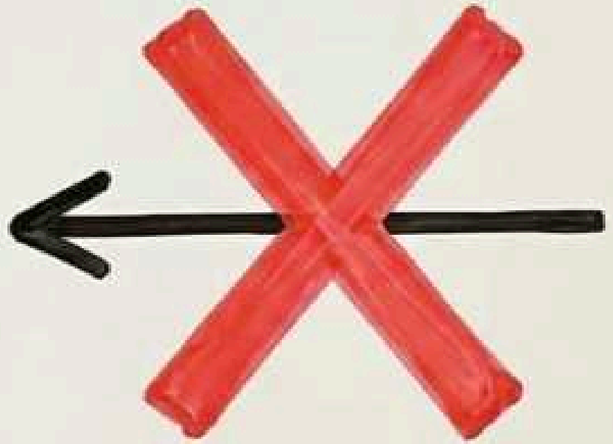
A 2,000-year-old tradition of passing on patterns with a rhyme.

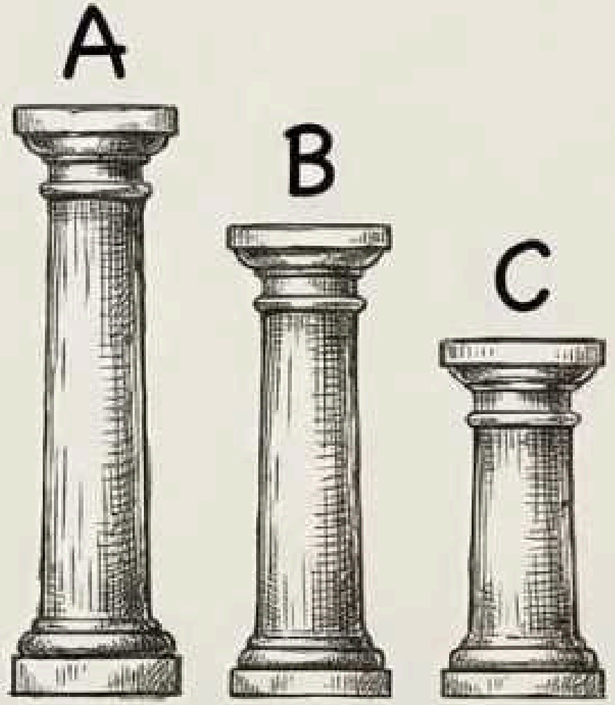
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The Limits of the Syllogism.

¶ 3.15

Categorical Logic.





A > B > C

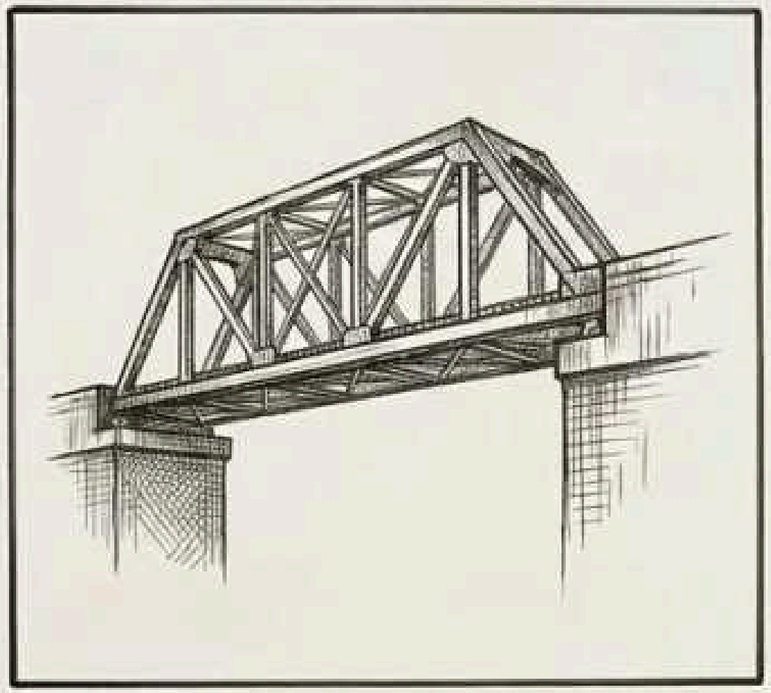
Everyday reasoning about relations (e.g., A is taller than B, B is taller than C) requires more than simple categories.

This limitation motivated the next evolution of logic.

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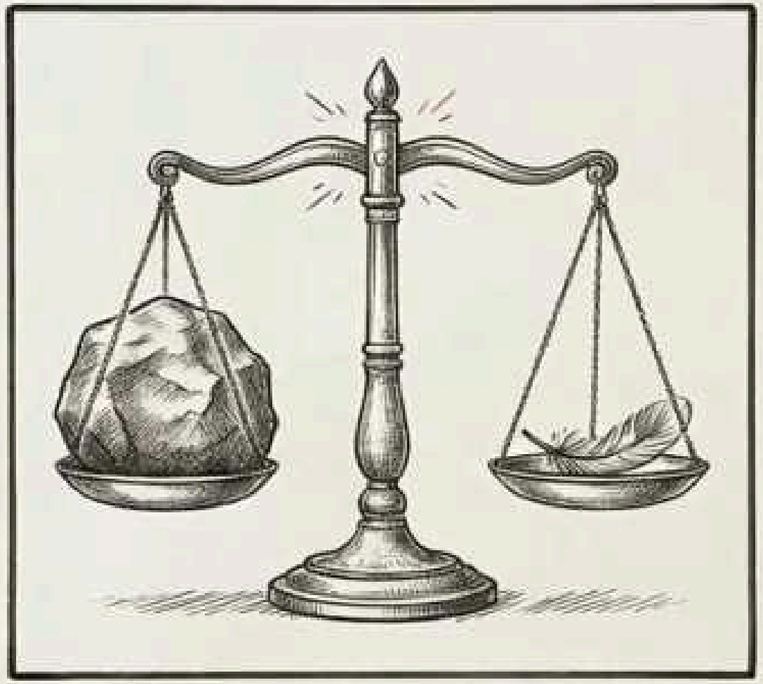
Lasting Lessons.

¶ 3.16



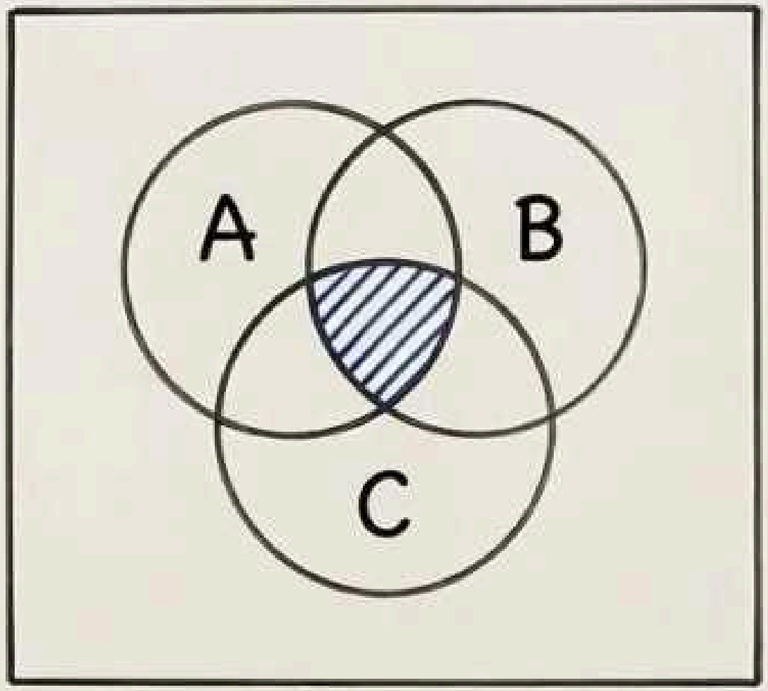
Structure.

1. Validity depends entirely on structure.



Truth ≠ Validity.

2. True premises and a true conclusion do not guarantee a valid argument.



Visual Proof.

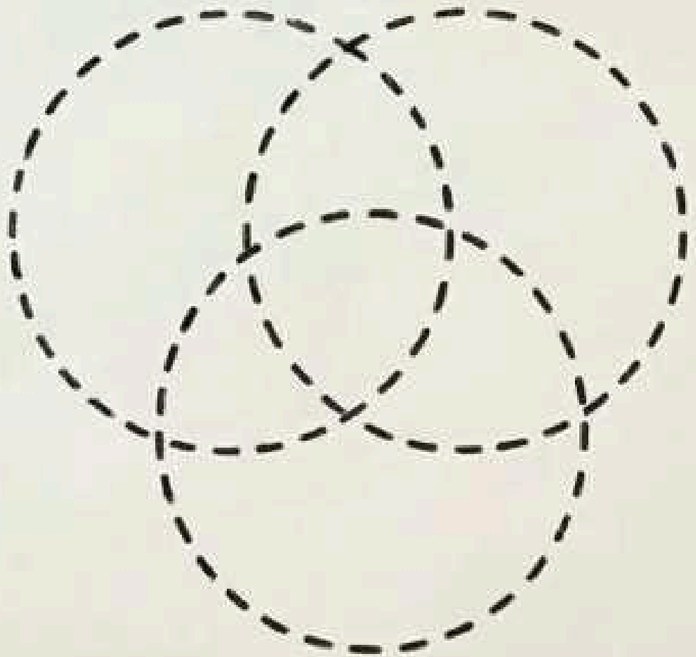
3. Pictures can prove why an argument works.

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Takeaway Challenge.

¶ 3.17

All politicians seek power. He seeks power.
Therefore, he must be a politician.

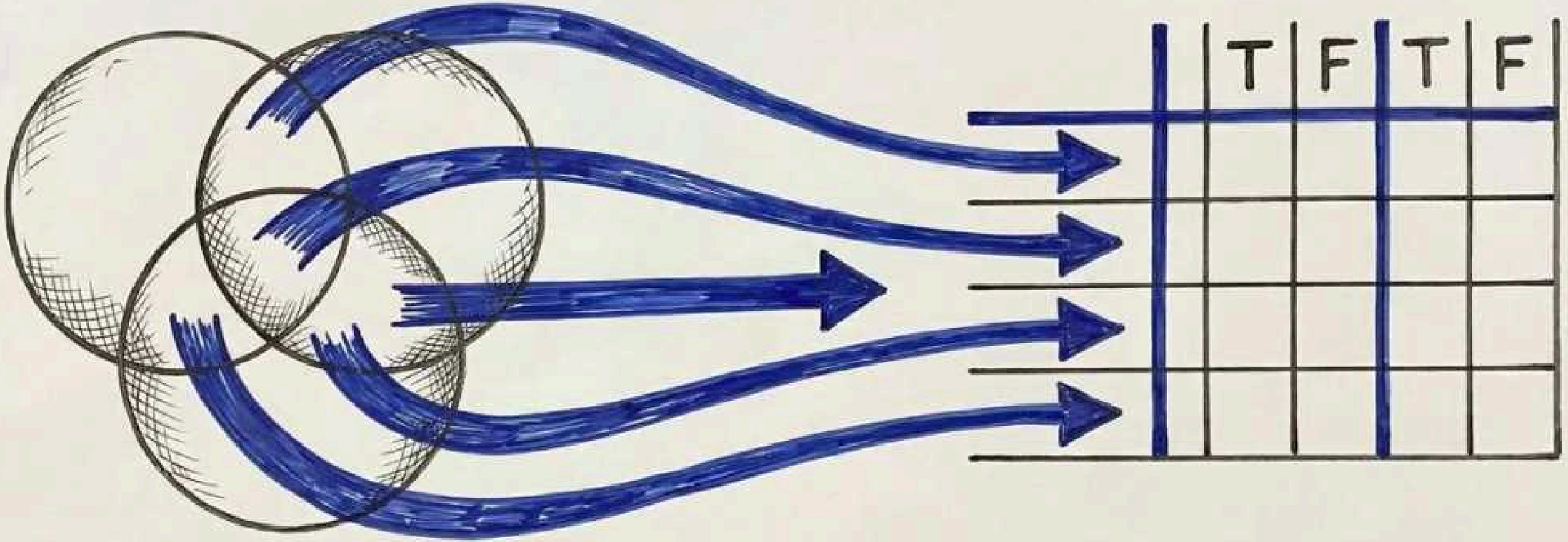


Is it valid? Mentally shade the diagram to find out if the conclusion is already in the picture.

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Next Time: Lecture Four.

¶ 3.18



We move beyond categories to whole statements, and meet the architecture of truth tables.

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