

Logic

Aristotelian Syllogistic: Introduction, Terms, Propositions

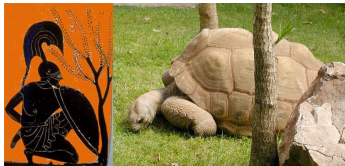
I. Transition to Aristotelian Logic

The Limits of Stoic Logic (& the Propositional Calculus)



Lewis Carroll
(1832–1898)

- A syllogism
 - (A) Things that are equal to the same are equal to each other.
 - (B) The two sides of this Triangle are things that are equal to the same.
 - (Z) The two sides of this Triangle are equal to each other.
- Analysis
 - It is clearly valid.
 - PC does nothing to help us to see that it is valid
 - The Tortoise's suggestion—adding $((A \wedge B) \rightarrow Z)$ —is no solution.
 - We don't need another premise.
 - We need a way to analyze the premises we already have.



Two Arguments Contrasted

- Euclid says:
 - (A) Things that are equal to the same are equal to each other.
 - (B) The two sides of this Triangle are things that are equal to the same.
 - (Z) The two sides of this Triangle are equal to each other.
- “Here's the situation we McCain-sympathizing/Paulson-plan-skeptics/populist-inclined/but we've-got-to-be-responsible-in-a-crisis types face:
 1. Something probably needs to be passed soon.
 2. There are almost certainly superior alternatives to Paulson or even (especially?) to Paulson-as-modified
 3. There's not enough time to write a new plan, get a consensus behind it, etc.
 - So: 4. We need to pass Paulson-as-modified ASAP.” — Wm Kristol
- How are these arguments (logically) different

Analysis of Euclid's Syllogism

- The Syllogism (again)
 - (A) Things that are equal to the same are equal to each other.
 - (B) The two sides of this Triangle are things that are equal to the same.
 - (Z) The two sides of this Triangle are equal to each other.
- What the syllogism lacks—any propositional structure build on *if, or, not-both*.
- What it has—repetition of terms within the propositions (as Stoic Logic required the repetition of basic propositions).
 - (A) Things that are equal to the same are equal to each other.
 - (B) The two sides of this Triangle are things that are equal to the same.
 - (Z) The two sides of this Triangle are equal to each other.

The Stages of Aristotelian Logic

Corresponding to ...	A Theory of ...
The First Act of the Intellect (Conception)	Terms
The Second Act of the Intellect (Judgment)	(Categorical) Propositions
The Third Act of the Intellect (Inference)	(Categorical) Syllogisms

II. Aristotelian Terms

Thoughts & Words

“What is in speech are symbols of affects in the mind;

what is written are symbols of what is in speech.

Just as what is written is different for different peoples; so also what is in speech.

The affects in the mind, which the signs primarily signify, are the same for everyone, as are the things of which they are the likenesses, &c.”

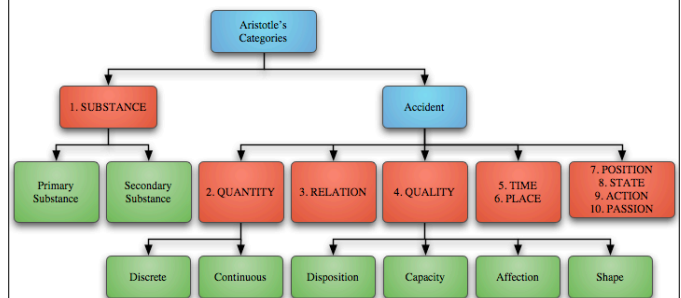
— Aristotle, *On Interpretation* 1



Universal		Culturally Variable	
Things	Concepts (=Affects in the mind)	Spoken Words	Written Words

III. Categories

Aristotle's Categories (organized)



Aristotle's Categories (listed)

1. Substance (Being)

- “that which is neither predicable of a subject nor present in a subject;
 - for instance, the individual man or horse.”
- [in a secondary sense] those things ... within which, as species, the primary substances are included; also those which, as genera, include the species.
 - For instance, the individual man is included in the species ‘man’, and the genus to which the species belongs is ‘animal’;”

Aristotle's Categories (listed)

2. Quantity

- Discrete quantities
 - e.g., number and speech
- Continuous quantities
 - e.g., lines, surfaces, solids

3. Relation

- “Those things ... which, being either said to be of something else or related to something else, are explained by reference to that other thing.
 - For instance, the word ‘superior’”

4. Quality

- that in virtue of which people are said to be such and such.
- used in many senses
 - Disposition
 - Capacity
 - Affective qualities and affections. Sweetness, bitterness, sourness,
 - Figure and the shape that belongs to a thing; and besides this, straightness and curvedness and any other qualities of this type;

Aristotle's Categories (listed)

5. Time
6. Place
7. Position
 - E.g., seated, standing
8. State
 - E.g., shod, armed
9. Action
 - E.g., cutting, heating
10. Passion
 - E.g., being cut, being heated

Examples of Aristotle's Use of the Categories

(1) In the *Topics* I.9, Aristotle writes:

“Next we must define the kinds of categories (τὰ γένη τῶν κατηγοριῶν) in which the four above-mentioned <predicates> are found. [There follows a list of the ten categories.] For the accident, the genus, the property, and the definition will always be in one of these categories.”

(2) In the *Nicomachean Ethics* II.5, Aristotle writes:

“Next we must consider what virtue is. Since things that are found in the soul are of three kinds—passions (πάθη), faculties (δύναμεις), states of character (ἔξεις), virtue must be one of these.”

This list derives from Aristotle's discussion of qualities in *Cat.* 8:

“Quality is a term that is used in many senses. One sort of quality let us call 'habit' (ἔξις) ... Another sort of quality is ... terms which refer to inborn capacity (δύναμις) or incapacity. ... A third class within this category is that of affective qualities and affections (πάθη).”

The Starting Point for Definition

- Categories are the highest genera into which things can be placed.
- So, they can form the starting point for definition.
 - E.g., Aristotle begins his search for the definition of “virtue” (*Nicomachean Ethics* II.5) with these words:

“Next we must consider what virtue is. Since things that are found in the soul are of three kinds—passions, faculties, states of character, virtue must be one of these.”

This list comes straight out of *Categories* VIII.

IV. Predicables

Five Predicables

Aristotle distinguishes five kinds of predicate or predicables, ways in which a term can be predicated of a subject (cf. *Topics* I.5).

- Genus
- Difference
- Definition
- Property
- Accident

Genus

- Definition
 - “What is predicated in the category of essence of a number of things exhibiting differences in kind”
- Examples
 - Man is an animal.
 - A bridge is a structure.
 - A lever is a machine.
 - Envy is an emotion.

[Specific] Difference

- Specific = Species-making
- Definition
 - What distinguishes one kind [species] of thing from another within the same genus
- Examples
 - Man is rational.
 - A bridge spans a gap or barrier.
 - A lever consists of a rigid bar which pivots on a fixed point.
 - Envy is caused by another's good fortune.

Definition

- Definition
 - “a phrase signifying a thing's essence”
 - = genus + specific difference
- Examples
 - Man is a rational animal.
 - A bridge is a structure spanning a gap or barrier.
 - A lever is a (simple) machine consisting of a rigid bar which pivots on a fixed point.
 - Envy is an emotion of sorrow caused by another's good fortune.
 - *Sorrow* could be placed in either
 - the genus: emotion of sorrow caused by another's good fortune
 - or the difference: emotion of sorrow caused by another's good fortune

Definition or Species?

- Aristotle puts *definition*
 - For this, the examples would be
 - *Man is a rational animal.*
 - *John is a rational animal.*
 - though in this case the predicate is the definition of the species of the subject, not of the subject itself
- Porphyry put *species*
 - For this, the example would be
 - *John is a man.*
 - Note that the subject here has to be an individual.

Property

- Definition
 - “a property which does not indicate the essence of a thing, but yet belongs to the thing alone, and is predicated convertibly of it”
 - These are predicated universally & exclusively of the subject.
 - Though there is some reason to distinguish “generic properties” that are universally of the subject but not exclusively so.
- Examples
 - Man is capable of recognizing humor.
 - A bridge has one end on either side of a gap or barrier.
- Examples of generic properties, which follow from the definition, but are not unique.
 - Man is capable of perception.
 - Levers provide a mechanical advantage.
 - Envy is a capital sin.

Accident

- Aristotle offers two definitions of an accident.
(These definitions are not equivalent.)
 - Definition #1—“something which, although it is none of the other predicables, yet belongs to the thing”
 - Definition #2—“something which may possibly either belong or not belong to any one and the self-same thing”
- Examples
 - Man lives on earth.
 - This bridge was paid for by federal funds.
 - This lever is made of iron.
 - Envy is a stereotypical Russian vice.