Philosophy 57 — Day 7

- Quiz #2 Today (Chapter 3 — "Fallacy Matching")
- On to Chapter 4 — Categorical Logic
  - The Language of Categorical Logic
  - Categorical Statements (four kinds)
  - Their Grammar (also called syntax)
  - Their Meaning (also called semantics)
  - Using Venn Diagrams to Picture Categorical Statements

Chapter 4: Categorical Statements — Overview & Definition

- I will not be covering sections 4.5 or 4.6. These sections are concerned with the traditional (ancient), Aristotelian perspective on categorical claims.
- Moreover, I will only be discussing the modern, Boolean perspective on categorical claims. This excludes some stuff from section 4.3 as well.
- Our goal in 4 & 5 is to learn how to analyze categorical *arguments* (*syllogisms*). First, we need categorical *statements* (their building blocks).
- Here are two examples of categorical statements in ordinary language:
  - ∗ Light rays travel at a fixed speed.
  - ∗ Not all convicted murderers get the death penalty.
- A categorical statement (or proposition) relates two classes or categories, denoted by the subject term (S) and the predicate term (P). Categorical statements assert that either all or part of S is included in (excluded from) P.
- What are S and P in the above two categorical statements?

Chapter 4: Categorical Statements — Forms & Components

- Categorical statements come in four standard forms (we'll discuss *translating* categorical claims from English into standard form at the end of the chapter):
  - ∗ All S are P.
  - ∗ No S are P.
  - ∗ Some S are P.
  - ∗ Some S are not P.
- The words "all", "no" and "some" are called quantifiers because they specify *how much of* S is included in (or excluded from) P.
- The words "are" and "are not" are called the copula, because they link (or "couple") the subject term with the predicate term.
- Consider the following example of a standard form categorical statement:
  - ∗ All members of the American Medical Association are persons holding degrees from recognized academic institutions.
- What are its quantifier, subject term, predicate term, and copula?

Chapter 4: Categorical Statements — Quality, Quantity & Distribution I

All S are P.	Every member of the S class is a member of the P class. In other words, the S class is *contained in* the P class.
No S are P.	No member of the S class is a member of the P class. In other words, the S class is *excluded from* the P class.
Some S are P.	At least one member of the S class is a member of the P class.
Some S are not P.	At least one member of the S class is *not* a member of the P class.

- The quality of a categorical claim is either affirmative or negative, depending on whether it *affirms* or *denies* class membership.
  - "All S are P" and "Some S are P" have *affirmative* quality.
  - "No S are P" and "Some S are not P" have *negative* quality.
- The quantity of a categorical claim is either universal or particular, depending on whether it makes a claim about *every* member or just *some* member of S.
  - "All S are P" and "No S are P" are *universal*.
  - "Some S are P" and "Some S are not P" are *particular*.

Chapter 4: Categorical Statements — Quality, Quantity & Distribution II

- **Meaning Note**: "Some S are P" does ***not*** imply "Some S are not P."
- It is customary to give the single letter names "**A**", "**E**", "**I**", and "**O**" to the four kinds of standard form categorical claims (first four vowels).

Proposition	Letter Name	Quantity	Quality
All S are P.	**A**	Universal	Affirmative
No S are P.	**E**	Universal	Negative
Some S are P.	**I**	Particular	Affirmative
Some S are not P.	**O**	Particular	Negative

- Unlike quality and quantity, which are attributes of entire categorical statements, distribution is a property of a *term* in a categorical statement.
- A term X is distributed in a categorical statement if the statement asserts something about *every* member of the class X (otherwise, X is *un*distributed).
- For instance, in the categorical statement (**A**) "All S are P", the term S is distributed, but the term P is *un*distributed (*why*?). What about **E**, **I**, **O** claims?

Chapter 4: Categorical Statements — Quality, Quantity & Distribution III

- To determine whether terms are distributed in claims, it helps to visualize what the claims assert about S and P using Venn Diagrams.
- In an **E** claim, "No S are P", an assertion is made about every member of the class S (*i.e.*, that every member of the class S is *outside of* the class P).
- But, **E** claims *also* assert something about every member of the class P (*i.e.*, that every member of the class P is *outside of* the class S).
- So, *both* S *and* P are distributed in an **E** claim "No S are P".
- In an **I** claim, "Some S are P", an assertion is made about *at least one* member of S and *at least one* member of P. But, *no* assertion is made about *every* member of either class. So, *neither* S *nor* P is distributed in an **I** claim.
- In an **O** claim, "Some S are not P", an assertion is made about *at least one* member of S, but *not* about *every* member of S. So, S is *un*distributed in **O**.
- But, P *is* distributed in an **O** claim. *Why*? Use a Venn Diagram here.

Chapter 4: Categorical Statements — Quality, Quantity & Distribution IV

Proposition	Name	Quantity	Quality	*S*	*P*
All *S* are *P*.	**A**	Universal	Affirmative	Distributed	Undistributed
No *S* are *P*.	**E**	Universal	Negative	Distributed	Distributed
Some *S* are *P*.	**I**	Particular	Affirmative	Undistributed	Undistributed
Some *S* are not *P*.	**O**	Particular	Negative	Undistributed	Distributed

- It may help to simply *memorize* the cases of distribution. The text offers two mnemonic devices for remembering the above facts about distribution.

  Mnemonic #1. **U**nprepared **S**tudents **N**ever **P**ass.

  Universals distribute **S**ubjects. **N**egatives distribute **P**redicates.

  Mnemonic #2. **A**ny **S**tudent **E**arning **B**'s **I**s **N**ot **O**n **P**robation.

  A distributes **S**ubject. **E** distributes **B**oth.

  I distributes **N**either. **O** distributes **P**redicate.

- I prefer to *deduce* these using Venn Diagrams and the *definition* of distribution. In Logic, answers can always be *deduced* from basic definitions.

Chapter 4: Categorical Statements — Venn Diagrams & The Square of Opposition I

- Ultimately, we will use Venn Diagrams to test categorical *arguments* (*syllogisms*) for validity and invalidity. First, we need to learn how to represent categorical *statements* using Venn Diagrams.
- We will always operate from the *modern*, *Boolean* standpoint. You can ignore the stuff in the book about the traditional, Aristotelain standpoint.
- The standard from categorical statements can be understood as follows:

  (A) All S are P. = No members of S are *outside* P.

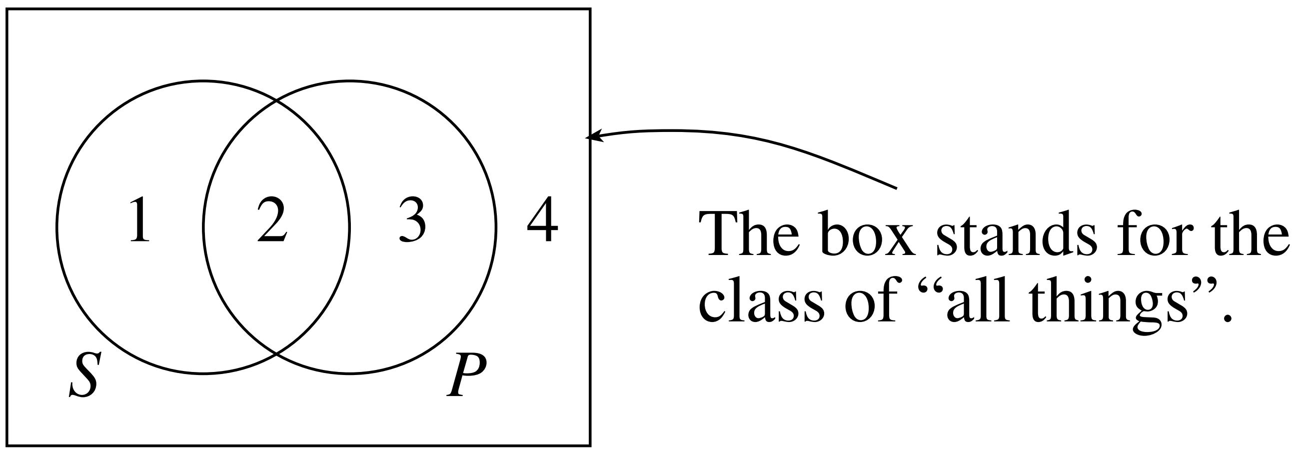
  (E) No S are P. = No members of S are *inside* P.

  (I) Some S are P. = At least one S exists, and that S is a P.

  (O) Some S are not P. = At least one S exists, and that S is not a P.
- **Note**: **A** and **E** do *not* imply that any S's *exist*! This is the modern, Boolean standpoint. On the Aristotelian view, **A** and **E** *do* imply that some S's exist.
- Consider "All unicorns are one-horned animals" (Boolean *vs* Aristotelian).

Chapter 4: Categorical Statements — Venn Diagrams & The Square of Opposition II

- To represent categorical statements using Venn Diagrams, we draw a box containing two overlapping circles. The box stands for "all things", and the two circles stand for the S and P classes in the claim being represented.

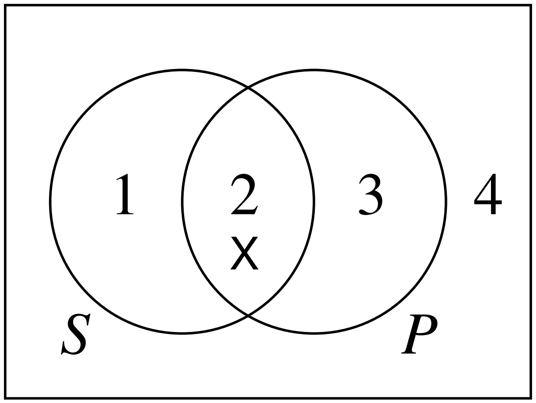


- It is helpful to think about which class of things are contained in each of 1–4.
- Region 1 = the class of things which are inside S but outside P.
  Region 2 = the class of things which are inside S and inside P.
  Region 3 = the class of things which are outside S and inside P.
  Region 4 = the class of things which are outside S and outside P.

Chapter 4: Categorical Statements — Venn Diagrams & The Square of Opposition III

- Next, we adopt the following two Venn Diagram conventions.
  1. If a region (*i.e.*, 1–4) is *empty*, we use *shading* (*hashing*) to indicate this.
  2. If a region contains *at least one thing*, we use an "X" to indicate this.
- For instance, recall that the **I** claim "Some *S* are *P*" asserts that *at least one S exists, and that S is inside of P*. How would we draw a *Venn Diagram* for **I**?

(**I**) Some *S* are *P*.

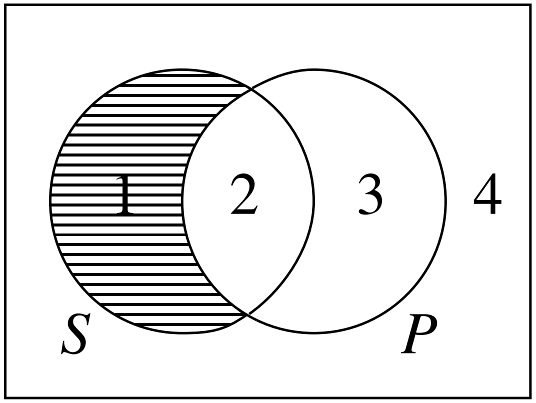


- "Some *S* are *P*" does ***not*** imply "Some *S* are not *P*". The fact that there is something in region 2 does ***not*** imply that there is anything in region 1.
- What about the other three standard form categorical claims?

Chapter 4: Categorical Statements — Venn Diagrams & The Square of Opposition IV

- **A** and **E** claims will both involve *shading* (*hashing*) regions.

(**A**) All *S* are *P*.



- Let's draw the **E** and **O** diagrams together on the board.
- Consider the following simple Categorical argument ("immediate inference"):

  Some trade spies are not masters at bribery.
  Therefore, it is false that all trade spies are masters at bribery.

- Let's use Venn diagrams to prove that this argument is *valid*. First, we must express the argument using *standard form* categorical statements. Then, we will draw Venn Diagrams of the premise and the conclusion.