Philosophy 57 — Day 10

- Quiz #2 Curve (approximate)
  - 100 (A); 70–80 (B); 50–60 (C); 40 (D); < 40 (F)
- Quiz #3 is next Tuesday 03/04/03 (on chapter 4 – not tnanslation)
  - Sections 4.5–4.6 *skipped* (no Aristotelian stuff)
  - Venn Diagrams, structure, and meaning of categorical claims
- Back to Chapter 4 — Categorical Statements
  - Conversion, Obversion, and Contraposition
  - Translating from English into Categorical Logic (not on quiz #3)

Chapter 4: Categorical Statements — Conversion, Obversion & Contraposition I

- Conversion, Obversion, and Contraposition are three important operations or transformations that can be performed on categorical statements.
- The Converse of a categorical statement is obtained by switching its subject and predicate terms. This switching process is called Conversion.

Proposition	**Name**	**Converse**
All *A* are *B*.	**A**	All *B* are *A*.
No *A* are *B*.	**E**	No *B* are *A*.
Some *A* are *B*.	**I**	Some *B* are *A*.
Some *A* are not *B*.	**O**	Some *B* are not *A*.

- Some statements are *equivalent to* (*i.e.*, *have the same Venn Diagram as*) their converses. Some statements are *not* equivalent to their converses.
- **E** and **I** claims are equivalent to their converses, whereas **A** and **O** claims are *not* equivalent to their converses. Let's *prove* this with Venn Diagrams.

Chapter 4: Categorical Statements — Conversion, Obversion & Contraposition II

- The complement of a term "X" is written "non-X", and it denotes the class of things *not* contained in the X-class. Do not confuse "not" and "non-". "not" is part of the *copula* "are not", but "non-" is part of a *term* "non-X" ("non-X" can be either the subject term or the predicate term of a categorical statement).
- The Obverse of a categorical statement is obtained by: (1) switching the quality (but *not* the quantity!) of the statement, and (2) replacing the predicate term with its complement. This 2-step process is called Obversion.

Proposition	**Name**	**Obverse**
All *A* are *B*.	**A**	No *A* are non-*B*.
No *A* are *B*.	**E**	All *A* are non-*B*.
Some *A* are *B*.	**I**	Some *A* are not non-*B*.
Some *A* are not *B*.	**O**	Some *A* are non-*B*.

- *All* categorical statements are logically equivalent to their obverses. Let's *prove* this for each of the four categorical claims, using Venn Diagrams.

Chapter 4: Categorical Statements — Conversion, Obversion & Contraposition II.1

- At this point, we need to be more careful with our Venn Diagram Method! So far, we have not seen any Venn Diagrams with complemented terms in them.
- Let's do an example to see how we must handle this new case.
- Here, I will go over the handout on my 2-Circle Venn Diagram Method.

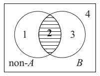
My 2-Circle Venn Diagram Technique: A Detailed Example

This handout explains my 2-circle diagram technique for determining the logical relationships between standard form categorical claims. Basically, this just involves working through an example in detail. As far as I know, this technique is original to me, and is different than the way Hurley does these problems. You may also do these the way Hurley does, if you prefer. This is just an alternative, which I think is more principled and methodical. I will now work through an example, in detail. I include much more detail than you really need, just to make sure that you understand each small step in the procedure (on quizzes and tests, all that's required are the two final diagrams, and the answer to the question about their logical relationship).

Detailed Example: What is the logical relationship between the following two standard-form categorical claims?

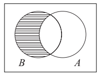
(i) No non-A are B.
(ii) All B are A.

Step 1: Draw the Venn Diagram for one of the two claims (it doesn't matter which one you start with). I'll draw the diagram for (i) first. Here, I use the numbers 1–4 to label the four regions of the diagram. And, I always label the left circle with the subject term of the claim, and the right circle with the predicate term of the claim. In this case, the subject term of (i) is "non-A" and the predicate term of (i) is "B." Since (i) is an **E** claim, we *shade the middle region* (in this case, region #2).



(i) No non-A are B.

Step 2: Draw the Venn diagram for the second claim — without numbers. The subject term of (ii) is "B" and the predicate term of (ii) is "A". And, since (ii) is an **A** claim, we *shade the left region*. No numbers in the four regions, yet ...

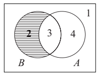


(ii) All B are A. (*no #'s yet*)

Step 3: Determine which classes of things the numbers 1–4 represent in the (i)-diagram. This step and the next are where the ***logic*** gets done! The following table summarizes the classes denoted by 1–4 in the (i)-diagram above. Remember, the class of things *outside non-X* is the same as the class of things *inside X* (and, *vice versa*: "*inside non-X*" = "*outside X*").

# in (i)-diagram	Class of objects denoted by # in (i)-diagram
1	objects inside non-A and outside B (hence objects outside A and outside B)
2	objects inside non-A and inside B (hence objects outside A and inside B)
3	objects outside non-A and inside B (hence objects inside A and inside B)
4	objects outside non-A and outside B (hence objects inside A and outside B)

Step 4: Place the numbers 1–4 in the appropriate regions in the diagram for claim (ii). Again, this is where the ***logic*** gets done! Begin with the left region of the (ii)-diagram. This region corresponds to objects inside B and outside A. Which number belongs there? Our table above tells us that the number "2" corresponds to those objects inside B and outside A. The middle region of the (ii)-diagram corresponds to those objects that are inside both A and B. That's the class denoted by the number "3" in the (i)-diagram. The right region of the (ii)-diagram corresponds to those objects that are inside A but outside B. That's where the number "4" sits in the (i)-diagram. Finally, the outer-most region of diagram (ii) corresponds to the objects that are outside both A and B. That's the region numbered "1" in the (i)-diagram. Thus, the *final* (ii)-diagram:



(ii) All B are A. (*final*)

☞ *All regions with the same numbers have the same markings in the* (i) *and* (ii) *diagrams*. So, (i) ***is equivalent to*** (ii). ❑

Chapter 4: Categorical Statements — Conversion, Obversion & Contraposition III

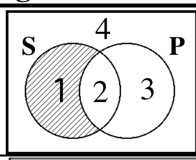
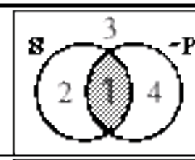
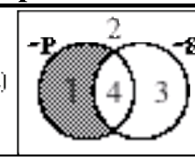
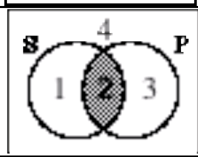
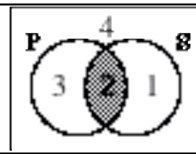
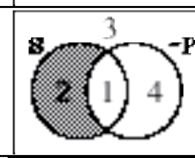
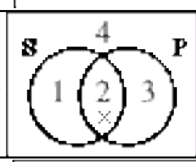
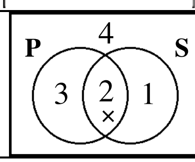
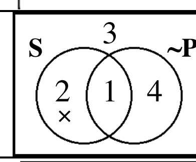
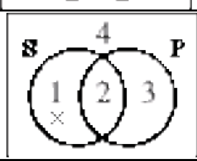
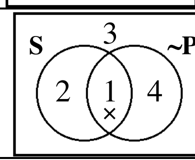
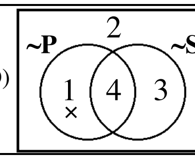
- The Contrapositive of a categorical statement is obtained by: (1) *converting* the statement, and (2) replacing both the subject term and the predicate term with their complements. This 2-step process is called Contraposition.

Proposition	**Name**	**Contrapositive**
All *A* are *B*.	**A**	All non-*B* are non-*A*.
No *A* are *B*.	**E**	No non-*B* are non-*A*.
Some *A* are *B*.	**I**	Some non-*B* are non-*A*.
Some *A* are not *B*.	**O**	Some non-*B* are not non-*A*.

- Some statements are *equivalent to* (*i.e., have the same Venn Diagram as*) their contrapositives. Some statements are *not* equivalent to their contrapositives.
- **A** and **O** claims are equivalent to their contrapositives, whereas **E** and **I** claims are *not* equivalent to their contrapositives. Let's *prove* this with Venn's.

Chapter 4: Categorical Statements — Conversion, Obversion & Contraposition

Proposition	**Converse**	**Obverse**	**Contrapositive**
(**A**) All *A* are *B*.	All *B* are *A*. (≠)	No *A* are non-*B*. (=)	All non-*B* are non-*A*. (=)
(**E**) No *A* are *B*.	No *B* are *A*. (=)	All *A* are non-*B*. (=)	No non-*B* are non-*A*. (≠)
(**I**) Some *A* are *B*.	Some *B* are *A*. (=)	Some *A* are not non-*B*. (=)	Some non-*B* are non-*A*. (≠)
(**O**) Some *A* are not *B*.	Some *B* are not *A*. (≠)	Some *A* are non-*B*. (=)	Some non-*B* are not non-*A*. (=)

Categorical Claim	Converse	Obverse	Contrapositive
(A) 	All P are S	Obverse(A) 	Contrapositive(A) 
(E) 	Converse(E) 	Obverse(E) 	No non–P are non–S
(I) 	Converse(I) 	Obverse(I) 	Some non–P are non–S
(O) 	Some P are not S	Obverse(O) 	Contrapositive(O) 

Chapter 4: Categorical Statements — Translation from English Overview

- Many English claims can be translated faithfully into one of the four standard form categorical claims. There are 10 things to look out for.
  * Terms Without Nouns
  * Nonstandard Verbs
  * Singular Propositions
  * Adverbs and Pronouns
  * Unexpressed Quantifiers
  * Nonstandard Quantifiers
  * Conditional Statements
  * Exclusive Propositions
  * "The Only"
  * Exceptive Pronouns
- You do not need to remember the names of these 10 watchwords, but you'll need to know how to translate English sentences which involve them.

Chapter 4: Categorical Statements — Translation from English I

- Terms Without Nouns: The subject and predicate terms of a categorical proposition must contain either a plural noun or a pronoun that serves to denote the class indicated by the term.
- Nouns and pronouns denote classes, while adjectives (and participles) connote attributes or properties. We must replace mere adjectives with noun phrases.
- Examples:
  - "Some roses are red." Here, the subject term is a noun and properly denotes a class of things (i.e., roses). But, the predicate term is a mere adjective and does not denote a class. How do we fix this?
  - "All tigers are carnivorous." Again, the subject term is a noun and properly denotes a class of things (*i.e.*, tigers). But, the predicate term is a mere adjective and does not denote a class. How do we fix this?

Chapter 4: Categorical Statements — Translation from English II

- Nonstandard Verbs: The only copulas that are allowed in standard form are "are" and "are not." Statements in English often use other forms of the verb "to be." These need to be translated into standard form.
- Examples:
  - "Some college students will become educated." How do we translate this into something of the standard form "Some college students are _______"?
  - "Some dogs would rather bark than bite." How do we translate this into something of the standard form "Some dogs are _______"?
- Sometimes the verb "to be" does not occur at all, as in:
  - "Some birds fly south for the winter." How do we translate this into something of the standard form "Some birds are _______"?
  - "All ducks swim." How do we translate this into something of the standard form "All ducks are _______"?

Chapter 4: Categorical Statements — Translation from English III

- Singular Propositions: A singular proposition is one that makes an assertion about a specific person, place, thing, or time. We translate singular propositions into *universal* categorical claims using parameters.
- Examples:
  - "George went home" becomes "All **persons identical to George** are persons who went home." (I'll write the *parameters* in boldface)
  - "Sandra did not go shopping" becomes "No **persons identical to Sandra** are persons who went shopping".
    - NOTE: Interpreting singular claims as universal categorical statements loses some of the meaning of such expressions. Why?
  - "There is a radio in the back bedroom" becomes "All **places identical to the back bedroom** are places where there is a radio." OR "Some radios are things in the back bedroom".

- "The moon is full tonight" becomes "All **times identical to tonight** are times the moon is full" OR "All **things identical to the moon** are things that are full tonight."
- "I hate gin" becomes "All **persons identical to me** are persons who hate gin".

- NOTE: We do *not* use parameters in cases where they would be redundant. For instance, consider the English sentence "Diamonds are carbon allotropes".
  - Correct: All diamonds are carbon allotropes.
  - Incorrect: All things identical to diamonds are things identical to carbon allotropes.
- More Examples:
  - ∗ "Joseph J. Johnson discovered the electron"
  - ∗ "There is a giant star in the Tarantula Nebula"
  - ∗ "Cynthia travels where she wants"

Chapter 4: Categorical Statements — Translation from English IV

- Adverbs and Pronouns: When a statements contains a spatial adverb like "where", "wherever", "anywhere", "everywhere" or "nowhere" – it may be translated in terms of "places". Examples:
  - "Nowhere on earth are there any unicorns" becomes "No places on earth are places there are unicorns."
  - "She goes wherever she chooses" becomes "All places she chooses to go are places she goes".
- Temporal adverbs like "when", "whenever", "anytime", "always" or "never" are translated in terms of "times". Examples:
  - "She never brings her lunch to school" becomes "No times she goes to school are times she brings her lunch"
  - "He is always clean shaven" becomes "All times are times he is clean shaven."

- Pronouns such as “who”, “whoever”, “anyone”, “what”, “whatever” or “anything” get translated in terms of “persons” or “things”. Examples”
  - “Whoever works hard will succeed” becomes “All persons who work hard are persons who will succeed”
  - “She does whatever she wants” becomes “All things she wants to do are things she does”.
- More Examples:
  - “He glitters when he walks”
  - “He always wars a suit to work”

Chapter 4: Categorical Statements — Translation from English V

- Unexpressed Quantifiers: Many statements in English have quantifiers that are implied but not expressed explicitly. When we add quantifiers, we need to get as close to the original meaning as possible:
  - "Children live next door" becomes "Some children are persons who live next door"
  - "A tiger roared" becomes "Some tigers are animals that roared"
  - "Emeralds are green gems" becomes "All emeralds are green gems"
  - "There are lions in the zoo" becomes ______?
  - "Children are human beings" becomes ______?
  - "Monkeys are mammals" becomes ______?
  - "Dolphins are swimming beneath the breakers" becomes ______?

Chapter 4: Categorical Statements — Translation from English VI

- Unexpressed Quantifiers: In English there are many types of quantifiers. In categorical logic, there are only two. Nonstandard quantifiers must be translated into standard quantifiers in a way that best preserves meaning.
  - "A few soldiers are heroes" becomes "____ soldiers are heroes"
  - "Not everyone who votes is a Democrat" becomes ____?
  - "Not a single dog is a cat" becomes ____?
  - "All newborns are not able to talk" becomes ____?
  - "All athletes are not superstars" becomes ____?
- Sometimes, more than one categorical claim will be required to capture the meaning of an English sentence with a nonstandard quantifier:
  - "A small percentage of the sailors entered the regatta" becomes ____?
  - "Few marriages last a lifetime" becomes ____?

Chapter 4: Categorical Statements — Translation from English VII

- Conditional Statements: Conditional statements can often be translated into universal categorical claims.
  - "If it's a mouse, then it's a mammal" becomes "All mice are mammals"
  - "If an animal has four legs, then it's not a bird" becomes ____?
- When the "if" occurs in the middle of a sentence, we need to move it to the beginning, then translate into a universal claim:
  - "A person will succeed if he or she perseveres" becomes "If a person perseveres, then they will succeed" and then "All persons who persevere are persons who will succeed."
  - "Jewelry is expensive if it is made of gold" becomes ____?
- The key is to preserve the meaning of the conditional. A helpful rule about conditionals is called transposition, which says that "If p, then q" is equivalent to "If not q, then not p". (looks like *contraposition*!)

  - "If something is not valuable then it is not scarce" becomes (by transposition) "If something is scarce then it is valuable" and then ____?

- Whenever you see "*p unless q*", you can read this as "*p if not q*".
  - "Tomatoes are edible unless they are spoiled" becomes "If a tomato is not spoiled then it is edible." and then ____?
  - "Unless a boy misbehaves he will be treated decently" becomes ____ and then ____?

Chapter 4: Categorical Statements — Translation from English VIII

- Exclusive Propositions: Many propositions involve the words “only“, “none but”, “none except” and “no . . . except” are exclusive propositions. We must be careful to get the subject and predicate terms right in such examples. It helps to translate into a conditional statement first, then into a universal categorical statement:
  - “Only elected officials will attend the convention”. Which is correct: “All elected officials are persons who will attend the convention” or “All persons who will attend the convention are elected officials”?
  - “None but the brave deserve the fair”. Which is correct: “All persons who deserve the fair are brave persons” or “ All brave persons are persons who deserve the fair”?
  - ”No birds except peacocks are proud of their tails.”
  - **General hint**: “Only *A* are *B*” becomes “All *B* are *A*”. The same goes for “none but . . . ” and “no . . . except”.

Chapter 4: Categorical Statements — Translation from English IX & X

- "The Only": "The only *A* are *B*" gets translated as "All *A* are *B*". Note "*the* only" is different than "Only" in this sense.
  - "The only animals that live in this canyon are skunks" becomes "All animals that live in this canyon are skunks".
  - "Accountants are the only ones who will be hired" becomes ____ and then ____?
- Exceptive Propositions: Statements of the form "All except *S* are *P*" require *two* categorical statements for proper translation.
  - "All except students are invited" becomes "No students are invited persons, *and* ____".
  - "All but managers must report to the president" becomes ____ *and* ____?

Chapter 4: Categorical Statements — Translation from English: Table of Hints

Key Word (to be eliminated)	Translation Hint
whoever, wherever, always, anyone. never, etc.	use "all" together with persons, places, times
a few	"some"
if ... then	use "all" or "no"
unless	"if not"
only, none but, none except, no ... except	use "all" and switch order of terms
the only	"all"
all but, all except, few	two statements required
not every, not all	"some ... are not"
there is, there are	"some"