

### 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 translation)
  - 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.	<b>A</b>	All B are A.
No A are B.	<b>E</b>	No B are A.
Some A are B.	<b>I</b>	Some B are A.
Some A are not B.	<b>O</b>	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.	<b>A</b>	No A are non-B.
No A are B.	<b>E</b>	All A are non-B.
Some A are B.	<b>I</b>	Some A are not non-B.
Some A are not B.	<b>O</b>	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 the 2-circle Venn Diagram technique for determining the logical relationship between translated from natural language statements. This just involves switching the terms in the subject and predicate terms. In the case of the obverse, the subject and predicate terms are switched. In the case of the converse, the subject and predicate terms are switched. In the case of the contrapositive, both the subject and predicate terms are switched. In the case of the contrapositive, both the subject and predicate terms are switched. In the case of the contrapositive, both the subject and predicate terms are switched.

**Step 1:** Draw the Venn Diagram for the original claim. Without prejudice, the subject term of “S” and the predicate term of “P” have their circles in a circle. In the case of the obverse, the subject term of “S” and the predicate term of “P” have their circles in a circle. In the case of the converse, the subject term of “S” and the predicate term of “P” have their circles in a circle. In the case of the contrapositive, both the subject and predicate terms are switched.

**Step 2:** Draw the Venn Diagram for the original claim. Without prejudice, the subject term of “S” and the predicate term of “P” have their circles in a circle. In the case of the obverse, the subject term of “S” and the predicate term of “P” have their circles in a circle. In the case of the converse, the subject term of “S” and the predicate term of “P” have their circles in a circle. In the case of the contrapositive, both the subject and predicate terms are switched.

**Step 3:** Compare the two diagrams. If the two diagrams are identical, then the two statements are logically equivalent. If the two diagrams are not identical, then the two statements are not logically equivalent.

**Step 4:** Prove the obverse of each of the four categorical claims. For the obverse of “All A are B”, the subject term is “A” and the predicate term is “non-B”. The Venn Diagram for “All A are B” has two overlapping circles, “A” on the left and “B” on the right. The Venn Diagram for “No A are non-B” has two overlapping circles, “A” on the left and “non-B” on the right. The two diagrams are identical, so “All A are B” and “No A are non-B” are logically equivalent.

**Step 5:** Prove the converse of each of the four categorical claims. For the converse of “All A are B”, the subject term is “B” and the predicate term is “A”. The Venn Diagram for “All A are B” has two overlapping circles, “A” on the left and “B” on the right. The Venn Diagram for “All B are A” has two overlapping circles, “B” on the left and “A” on the right. The two diagrams are not identical, so “All A are B” and “All B are A” are not logically equivalent.

**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.	<b>A</b>	All non-B are non-A.
No A are B.	<b>E</b>	No non-B are non-A.
Some A are B.	<b>I</b>	Some non-B are non-A.
Some A are not B.	<b>O</b>	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. ( $\neq$ )	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. ( $\neq$ )
(I) Some A are B.	Some B are A. ( $=$ )	Some A are not non-B. ( $=$ )	Some non-B are non-A. ( $\neq$ )
(O) Some A are not B.	Some B are not A. ( $\neq$ )	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 wears 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”

