# Immediate Inferences: Obversion, Contraposition, obversion

An **immediate inference** is a deductive argument that has one categorical statement as a premise and one categorical statement as a conclusion. Since immediate inferences are deductive arguments, we want to evaluate whether they are valid or invalid (in order to determine soundness, we’d need to know whether the premises are true—categorical logic can’t tell us anything about this). In previous lectures, we talked about how these sorts of arguments can be tested using visual tools such as Venn diagrams and the square of opposition. In this lecture, we’ll talk about three classic rules that can also be used.

A neat note: Rules for determining the validity of categorical syllogisms have been taught to college students for over 1,000 years. In fact, categorical logic (and basically, anything else vaguely associated with Aristotle) probably made up a significant part of the curriculum in early universities throughout Britain, continental Europe, and the Middle East. Famous medieval logicians include the Arabic philosopher **Avicenna,** the Italian theologian **Thomas Aquinas,** the Jewish philosopher **Maimonides,** and the English monk **William of Ockham.** It’s difficult to overstate just how important these figures are for the way people came to think about topics like God, religion, faith, reason, science, etc. In many cases, they used the tools of categorical logic to draw surprising and interesting conclusions about these sorts of issues.

## Logical Equivalence Rules

Each categorical statement is **logically equivalent** (i.e. always has the *same* truth value) to a number of other statements. If a premise is logically equivalent to the conclusion, the argument is valid. For example, “No S are non-P. Therefore, All S are P” is a valid argument.

1. **Obversion** changes the quality (Affirmative/Negative) and replaces P with non-P. It works for all statements (A, E, I, and O).
   1. “All S are P” = “No S are non-P”
   2. “No S are P” = “All S are non-P”
   3. “Some S are P” = “Some S are not non-P”
   4. “Some S are not P” = “Some S are non-P”
2. **Conversion** switches the location of S and P. It works for E and I, but not for A and O.
   1. “No S are P” = “No P are S”
   2. “Some S are P” = “Some P are S”.
3. **Contraposition** switches the location of S and P, and replaces S with non-S and P with non-P. It works for A and O, but not for E and I.
   1. “All S are P” = “All non-P are non-S”
   2. “Some S are not P” = “Some non-P are not non-S”

All of these relationships work for FALSE statements as well. For example, if “All S are P” is FALSE, then the obversion “No S are non-P” is FALSE as well.

**What can I do with these rules?** You can use them to determine whether certain immediate inferences are valid or invalid. For example:

|  |  |  |
| --- | --- | --- |
| Inference | Valid? | Explanation |
| All guns are weapons. So, all weapons are guns. | No. | This involves switching P and S for an A-statement. It is an **illicit conversion.** |
| All guns are weapons. So, all non-weapons are non-guns. | Yes. | In contrast to conversion, contraposition works perfectly well for A-statements. So, this is a valid argument. |
| It is false that some gowns are dresses. So, it is false that some dresses are gowns. | Yes. | Both the premise and conclusion are I statements. We have simply switched S and P. This is a valid use of conversion. |
| Some wrists are not injured body parts. So, some wrists are body parts that are not injured. | Yes. | While this looks a bit odd, this is actually an instance of obversion. We start with a premise, change the quality (from “are not” to “are”) and then replace P with non-P. Obversion is always valid. |
| No non-pineapples are non-papers. So, no papers are pineapples. | No. | This is an instance of **illicit contraposition** (which doesn’t work for O-statements.). It’s also worth noting that the premise (which involves lots of “nos” and “nots”) is pretty difficult to understand for ordinary people. This is supposed to be one of the *values* of tools such as categorical logic—it allows to work on problems that our brains want to give up on. |

## Immediate Inference Relationships (Summary)

Here is a summary of all of the rules we’ve learned so far:

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| Name | Rule | Statements | Boolean or Aristotelian |
| Contradictory | A and O have opposite truth values  E and I have opposite truth values | All | Both |
| Obversion | Changes the quality (Affirmative/Negative) and switches P with non-P (and vice versa: non-P becomes P). | All | Both |
| Conversion | Switches the location of S and P. | E, I | Both |
| Contraposition | Switches the location of S and P. Switches S with non-S and P with non-P (and vice versa). | A, O | Both |
| Subalternation | If A is true, I is true; If I is false, A is false  If E is true, O is true; If O is false, E is false  “Truth flows downward; falsity flows upward” | All | Aristotelian |
| Contrary | If A is true, E is false; If E is true, A is false  “A and E can’t BOTH be true (but they both might be false)” | A and E | Aristotelian |
| Subcontrary | If I is false, O is true; If O is false, I is true  “I and O can’t BOTH be false (but they both might be true)” | I and O | Aristotelian |

## Solved Problems

Suppose the statement **“No poets are pencil pushers”** is TRUE. Use your knowledge of categorical logic to determine whether the following statements are TRUE, FALSE, or of interdeterminate truth value (that is, we don’t have enough knowledge to determine whether they are true or false). Do the exercise twice: first using the Boolean interpretation and then using the Aristotelian interpretation.

|  |  |  |
| --- | --- | --- |
| Statement | Boolean | Aristotelian |
| “All poets are pencil pushers.” | Indeterminate. Since we aren’t assuming that poets exists, there’s a possibility that both ALL poets could be pencil pushers, and NOT could be. | False (contrary relationship). Once we assume poets exist, the fact that none of them are pencil pushers means that they can’t all be pencil pushers! |
| “Some poets are pencil pushers.” | False (contradictory relationship) | False (contradictory relationship). |
| “Some poets are not pencil pushers.” | Indeterminate. The “no” statement we started with doesn’t assert that poets exist. This “some” statement does assert this. | True (Subalternation). Again, if we assume that poets exist, the fact that none of them are pencil pushers means that at least one must be something else! |
| “No pencil pushers are poets.” | True (conversion) | True (conversion) |
| “All pencil pushers are non-poets.” | True (obversion) | True (obversion) |
| “No non-poets are non-pencil pushers.” | Indeterminate (illicit contraposition). The fact that contraposition doesn’t work here means that we simply don’t know the truth of the statement in question. | Indeterminate (illicit contraposition) |
| “It is false that no pencil pushers are poets.” | False. We know that it is TRUE that no pencil pushers are poet. So, the claim that *this* is false is itself false. (These sorts of techniques end up being important in logic). | False. (See explanation to the right). |

## Review Question

For each of the following statements, perform the actions of obversion, conversion, and contraposition. Then, identify which of these “work” for this sort of statement (e.g., which produce a statement that is logically equivalent to what we started with.

1. “All Republicans are mammals.”
2. “No Democrats are reptiles.”
3. “Some Libertarians are health care workers who ride motorcycles.”
4. “Some Green Party members are not people who don’t eat meat.”