

# Logic

## Aristotelian Syllogistic: The Square of Opposition & Conversion

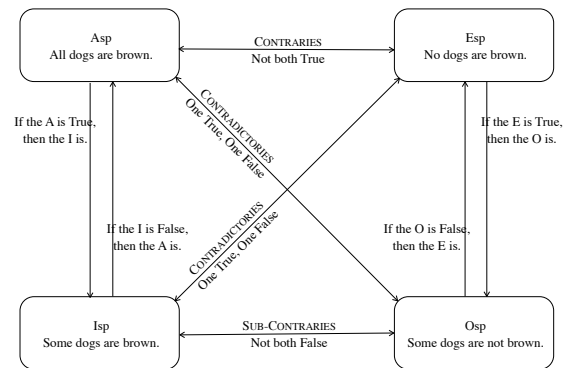
### Opposition

- What's the opposite of "All dogs are brown"?
  - "No dogs are brown"?
  - "Some dogs are not brown"?
- There are two kinds of opposition
  - Contrary Opposition
    - Contrary opposites are a pair of propositions that (as a matter of logical necessity given their relation to one another) cannot both be true, but can both be false.
  - Contradictory Opposition
    - Contradictory opposites are a pair of propositions that (as a matter of logical necessity given their relation to one another) have opposite truth value.

### The Square of Opposition

- The Square of Opposition shows the oppositions between propositions with the same subject and predicate but different logical form
  - A & E are contraries
    - "All dogs are brown" & "No dogs are brown"
  - A & O as well as E & I are contradictories
    - "All dogs are brown" & "Some dogs are not brown"
    - "No dogs are brown" & "Some dogs are brown"
- It also shows the relation between
  - I & O, which are not contrary as they can both be true
    - "Some dogs are brown" & "Some dogs are not brown"
  - A & I as well as E & O
    - "All dogs are brown" & "Some dogs are brown"
    - "No dogs are brown" & "Some dogs are not brown"

### The Square of Opposition



### Contradictory Opposition

- Definition
  - Contradictory opposites are a pair of propositions that (as a matter of logical necessity given their relation to one another) have opposite truth value.
- Place on the Square of Opposition
  - Propositions with the same subject & predicate, but different quantity & quality are contradictory opposites.
- Examples
  - The statements in the left & right column are equivalent.

All horses are hoofed.	It's false that	some horses aren't hoofed.
No horses are fish.	It's false that	some horses are fish.
Some horses are black.	It's false that	no horses are black.
Some horses aren't black.	It's false that	all horses are black.

### Contrary Opposition

- Definition
  - Contrary opposites are a pair of propositions that (as a matter of logical necessity given their relation to one another) cannot both be true.
- Place on the Square of Opposition
  - Universal propositions with the same subject & predicate, but different *quality* are contrary opposites.
- Examples
  - The statements in the left column imply the statement in the right.
  - But those in the right do not imply those in the left.

All horses are hoofed.	It's false that	no horses are hoofed.
No horses are fish.	It's false that	all horses are fish.

### Subcontrary Propositions

- Subcontrary propositions are not really opposed to one another at all.
  - They differ in quality, but they can both be true.
- Definition (by place on the Square)
  - Subcontrary propositions are a pair of particular propositions with the same subject & predicate, but opposite quality.
- Logical Rule
  - Subcontrary propositions cannot both be false.
- Examples
  - The statements in the left column imply the statement in the right.
  - But those in the right do not imply those in the left.

It's false that	Some horses are blue.	Some horses are not blue.
It's false that	Some horses are not mammals.	Some horses are mammals.

### Subalternation

- This is even less a matter of opposition than was sub-contrariety.
- Weakening
  - If a universal proposition is true, the particular proposition of the same quality with the same subject & predicate is also true.
  - Example
    - All dogs are mammals.
    - So, Some dogs are mammals.
  - Some people doubt this
    - But that is because they confuse two different things:
      - Logical implication, in which Asp implies Isp
      - Conversational implicature, in which one infers ~Asp from *the fact that someone said* Isp.
        - » Presumably, if Asp had been true, the speaker would have said so.
        - » But that presumption can be defeated.
- Another inference
  - If a particular proposition is false, the universal proposition of the same quality with the same subject & predicate is also false.
  - Example
    - It's false that some dogs are blue.
    - So, It's false that all dogs are blue.

