



Philosophy 220

Symbolization in SL 1

- In order to make it easier to examine the structure of our language and arguments, logicians have worked out a way of substituting symbols for the various parts of sentences in natural language. The language that results from this abstraction process is a symbolic language that we call *SL*.
- (SL stands for “Sentential Logic”)

Symbolic Language *SL*

- The sentence is the basic unit of the language *SL*.
 - Put another way, we will be concerned with sentences that express single propositions; that is, sentences that refer to one state of affairs that is or is not the case.
 - These sentences are called **simple sentences**
 - Examples of simple sentences:
 - The cat is on the mat.
 - California borders Oregon.
 - Biff owns a car.
 - Buffalo buffalo buffalo.

The basic units of *SL*

- The concept of a compound sentence in logic is similar to the concept of a compound sentence in English grammar, but not exactly the same.
 - For example, “I am wearing a red hat and red shoes” is not a grammatically compound sentence because ‘red shoes’ is not, by itself, a sentence.
 - It is, however, a compound sentence in logic because it expresses two propositions (*I am wearing a red hat; I am wearing red shoes*) and joins them together (*and*).
- A compound sentence in logic is one that expresses more than a single proposition, joined together in some way.

Compound sentences

- To clear up some potential confusion:
- The text authors refer to both **sentential connectives** and **truth-functional connectives**. We will be concerned solely with truth-functional connectives.
- This difference between the two could be clearer.
 - Sentential connectives connect grammatical sentences of natural language.
 - Truth-functional connectives connect sentences that express propositions in such a way as to make the truth of the compound sentence a *function* only of:
 - The truth-value of each individual proposition
 - The way these two propositions are connected

Connectives

- To say that the truth of some compound sentence is a function of the truth of its parts and the way in which they are connected is to say that that compound sentence is joined with a truth-functional connective.
- Consider:
 - “I’m Bob, and I’m a Libra”
 - This sentence expresses two propositions: *I’m Bob; I’m a Libra.*
 - The propositions expressed are joined by the word ‘*and*’.
 - The sentence “I’m Bob, and I’m a Libra” is true if the speaker is indeed Bob, *and* if the speaker is indeed a Libra.
- Contrast the sentence “I’m a Libra or a Gemini”

Truth-Functionality

Each component of the sentence:		The sentence:
I'm Bob	I'm a Libra	I'm Bob and I'm a Libra
T	T	T
T	F	F
F	T	F
F	F	F

A Truth Table:

Each component of the sentence:		The sentence:
I'm Bob	I'm a Libra	I'm Bob or I'm a Libra
T	T	T
T	F	T
F	T	T
F	F	F

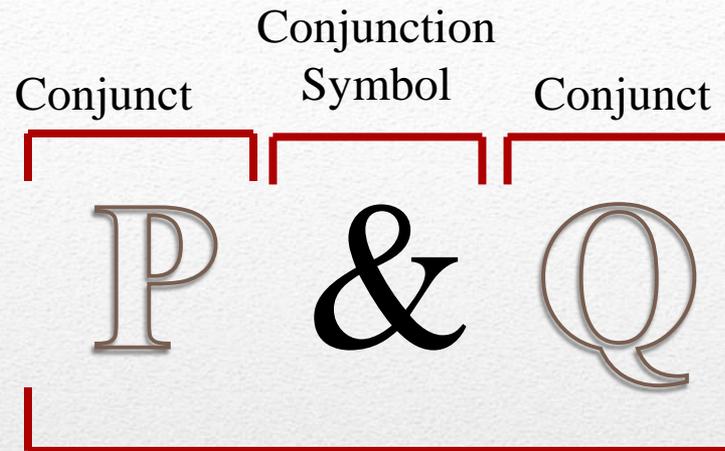
Another Truth Table:

- Every simple sentence can be represented in *SL* as a capital letter (with a subscript if necessary).
- The choice of capital letter is arbitrary.
- Single capital letters that stand for simple sentences are called **atomic sentences**.
- Any compound sentence can be represented by connecting atomic sentences by means of truth-functional connectives.
- Examples:
 - “I’m Bob” in *SL* is “B”

The vocabulary of *SL*

- Truth-functional connectives also have symbols in *SL*.
- Three that we will deal with today are:
 - $\&$: Conjunction: similar to English ‘and’
 - \vee : Disjunction: similar to English ‘or’
 - \sim : Negation: means ‘it is not the case that’

The vocabulary of *SL*

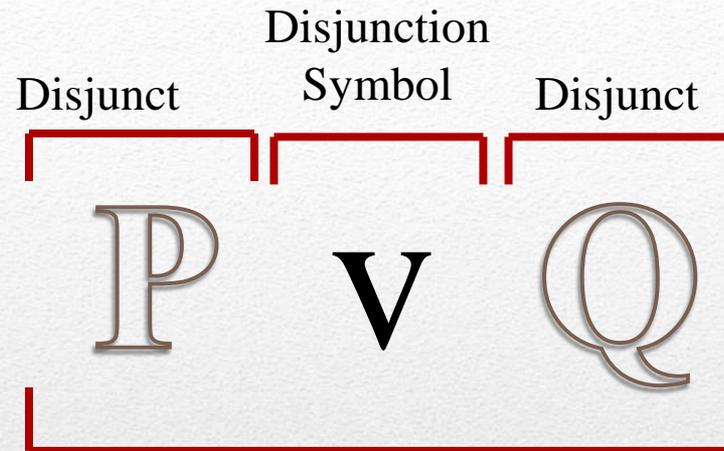


Conjunction

Conjunction

- Contrast:
 - “Galen and Watson are physicians”
- With
 - “The priest married John and Cathy”
- The first is an instance of truth-functional conjunction, symbolizable as $G \ \& \ W$ (Galen is a physician and Watson is a physician)
- The second is not an instance of truth-functional conjunction. The sentence does not mean that the priest married John and also that the priest married Cathy. Rather, the priest married John and Cathy to one another. This is symbolizable as M .

Conjunction Translation



Disjunction

Disjunction

- Contrast:
 - “I rode my bicycle yesterday or the day before.”
- With:
 - “You may have either a hamburger or a hot dog”
- The first is an example of an inclusive ‘or’, which translates straightforwardly to the ‘ \vee ’, yielding $Y \vee T$.
- The second is an example of the exclusive ‘or’ which yields $(H \vee D) \ \& \ \sim(H \ \& \ D)$, or “You may have a hamburger or a hot dog and not both a hamburger and a hot dog”.

Disjunction Translation

Negation
Symbol



Negation

Negation

- If B is “My cat has black fur”, then what is an acceptable English translation of ‘ \sim B’?
 - My cat does not have fur.
 - My cat has white fur.
 - The cat that is not mine has black fur
 - I do not have a cat that has black fur.
 - My dog has black fur.
 - It is not the case that my cat has black fur
- Pay special attention to negations of English sentences containing ‘all’, ‘no’, and ‘some’ (pp. 36-38)

Negation Translation
