Translating Compound Propositions

Going from English to symbols and visa versa.

Text Chapter 3 – Section 1

English to Symbols

- Determine the major connective – commas will help you.
- Each component simple proposition translate to a letter, p, q, or r.
  - Underline each simple proposition and label it with a letter or negation of the letter.
- Locate each connective and replace it with the symbol for that connective.
- Use parentheses or other signs of enclosure to group what comes before and after the major connective.

No in-class assignment problem

Example

- It is raining if and only if the ground is wet and the sky is dark.
  - It is a bi-conditional. Put ↔ under "if and only if."
  - Under "It is raining" put p.
  - Under "the ground is wet" put q.
  - Under "the sky is dark" put r.
- Put ∧ under the connective "and".
- Use parentheses to enclose the conjunction.
- Translation: $p \leftrightarrow (q \wedge r)$

In-class Assignment 10 - 1

Another Example

- If 2 > 4 and 7 is even, then 13 is odd or 6 + 3 = 8.
  - Basic connective is "if – then" symbol →
  - p: 2 > 4; q: 7 is even; ~r: 13 is not even; and s: 6 + 3 = 8
  - Translate the "and" the "or".
  - Use parentheses to enclose the conjunction and also the disjunction.
- Translation: $(p \wedge q) \rightarrow (\sim r \vee s)$

In-class Assignment 10 - 2

Going the Other Way

- p: Today is Thursday; q: 8 is not even; r: Logic makes sense
- Translate into English: $\sim[p \rightarrow (q \leftrightarrow \sim r)]$
- Start with the phrase "It is not true that" to negate the whole proposition.
- Start translating → with the word "if"
- Write p and follow it with the word "then"
- A comma is needed to because of the parentheses.
- Write q followed by "if and only if"
- Write the negation of r.
- Translation: It is not true that, if today is Thursday then, 8 is not even if and only if logic does not make sense.

In-class Assignment 10 - 3

Determine the truth value

- If p is true, q and r are false determine the truth value of $\sim(p \wedge \sim q) \rightarrow (\sim r \vee q)$.
  - Under each letter put "T" or "F".
  - Negate q and r.
  - Determine the truth value of the conjunction and then negate it.
  - Determine the truth value of the disjunction.
  - Determine the truth value of the conditional.

In-class Assignment 10 - 4

Determining the Truth Value

~(p ∧~q) → (~r∨ q)
  T   ~F   ~F F
~(T ∧ T) → (T∨ F)
    ~ T   →   T
       F   → T
          T