2.1.s. Summary

2.1.1. The prime role of the logical word *and* is to mark the use of a connective, called conjunction, that serves to form a compound sentence (also called a conjunction) from component sentences that may be referred to as its conjuncts. The process of interpreting a sentence as a conjunction is analysis. We use the sign ∧ (logical and) as symbolic notation for the operation of conjunction, marking the scope of a conjunction by parentheses. Alternatively, we can write a conjunction φ ∧ ψ as both φ and ψ, where both plays the role of a left parenthesis. The two forms can be mixed using and to mark conjunction and parentheses to mark scope. We will use capital letters to stand for unanalyzed components as we use lower case Greek to stand for any sentences, analyzed or not.

The effect of conjunction on the truth conditions of the compounds formed using it may be described in a truth table showing the compound to be true if and only if both components are true. The truth table specifies a truth function, so conjunction can be said to have a truth function as its meaning.

φ ψ	φ ∧ ψ
T T	T
T F	F
F T	F
F F	F

2.1.2-3. Conjunction is marked in English by stylistic variants of *and* as well as by *but* and similar words. Conjunction also can appear without explicit indication, particularly through the use of modifiers like attributive adjectives —though care is needed to be sure that such modifications can be captured by conjunction and to identify components that make independent contributions to the compound. The presence of quantifier words can preclude analysis as a conjunction even when the word *and* is present.

2.1.4. Since conjunction is used to combine only two components, uses of conjunction to combine more than two in a multiple conjunction will involve two or more connectives of differing scope, the one with widest scope counting as the main connective of the sentence. Such differences in scope can be marked in several ways in English but such markings may be absent in a serial conjunction. Some of the effect of serial conjunction without scope distinctions can be achieved by run-on conjunctions, such as φ ∧ ψ ∧ χ, which suppress parentheses.

2.1.6. The analysis of the logical form of a sentence can occur in stages in which we identify the immediate components of a compound, any immediate components of these, and so on. The last components arrived at are the ultimate components of the analysis; the full class of components includes them as well as all other sentences that could appear in the course of analysis (including the analyzed sentence itself). A sentence will usually have many logical forms representing different partial analyses of it.

2.1.7. We can specify a proposition or a truth value for a logical form by means of an intensional or extensional interpretation, assigning truth values or sentences, respectively, to its ultimate components. A sentence expressing the proposition provided by an intensional interpretation can be found by carrying out a process of synthesis that reverses the process of analysis. The truth value provided by an extensional interpretation can be found by calculation using the truth table for conjunction. The tabular notation used to write the truth table of conjunction may be used also to describe extensional interpretations and the values that they give to compound forms.

2.1.x. Exercises

1. Analyze each of the following sentences in as much detail as possible.
   a. *Mike visited both London and Paris*.
   b. *Ann wanted white wine but Bill and Carol wanted red*.
   c. *It will rain and clear off, but it will rain*.
   d. *That is a new but growing market*.
   e. *Confucius is affable but dignified, austere but not harsh, polite*

   but completely at ease. (*Analects* 7:37)
   f. *Although Tim lost his glasses and his wallet, each was returned*.
   g. *Tim lost his glasses and his wallet, and one person found both*.

2. Restate each of the following forms, putting English notation into symbols and vice versa (e.g., both A and B becomes A ∧ B, and A ∧ B becomes both A and B). Indicate the scope of connectives in the result by underlining.
   a. both A and both B and C
   b. both both A and B and C
   c. (A ∧ B) ∧ (C ∧ D)
   d. A ∧ ((B ∧ C) ∧ D)
   e. (A ∧ (B ∧ C)) ∧ D
   f. both both both A and B and C and D

3. The logical forms below are followed by intensional interpretations of their unanalyzed components. In each case, synthesize an idiomatic English sentence that expresses the corresponding interpretation of whole form. Remember that there may be more than one correct answer.
   a. (V ∧ F) ∧ R
      [F: *Fred visited Florence*; R: *Fred spent a week in Rome*; V: *Fred visited Venice*]
   b. (J ∧ (S ∧ F)) ∧ K
      [F: *he was fair*; J: *he was a judge*; K: *he had an excellent knowledge of the law*; S: *he was stern*]
   c. (C ∧ T ∧ H) ∧ (W ∧ F ∧ S)
      [C: *we arrived cold*; F: *we left stuffed*; H: *we arrived hungry*; S: *we left sleepy*; T: *we arrived tired*; W: *we left warm*]
   d. O ∧ O
      [O: *Old King Cole was a merry old soul*]

4. Calculate truth values for all compound components of the forms below using the extensional interpretation provided in each case.
   a.

A B C	A ∧ (B ∧ C)
T T F	

   b.

A B C D	((A ∧ D) ∧ C) ∧ (B ∧ A)
T T F T	

Homework assigned Mon 9/6 and due Wed 9/8

Analyze: *Although Al saw the problem and reported it, he was able to work around it*. (Remember that the final unanalyzed components should be complete sentences without pronominal cross-references from one to another.)