

**5.1.s. Summary**

5.1.1. One way to hedge a claim is to make it conditional on another one, limiting one's responsibility for the truth of the first claim to cases where the second is true. The English word *if* is used for this purpose. We will refer to the resulting compound (and the connective used to form it) as a **conditional**. Its two components are distinguished as the **antecedent** (which expresses the condition placed on the claim and appears as a subordinate clause in English) and the **consequent** (which is the claim that is made conditional and appears as a main clause). Although, the two components have a different significance in the compound, they can be stated in either order in English, with the antecedent preceded by *if*. The **rightwards** and **leftwards** arrows,  $\rightarrow$  and  $\leftarrow$ , provide our signs for the *if*-conditional; the two components may be written in either order but the arrow should be chosen to point from the subordinate to the main clause. As English notation, we write **if**  $\phi$  **then**  $\psi$  for  $\phi \rightarrow \psi$  and **yes**  $\psi$  **if**  $\phi$  for  $\psi \leftarrow \phi$ . When parentheses are to be used for grouping, we can use **if** for  $\leftarrow$  but we must resort to **implies** for  $\rightarrow$  (understanding this to indicate **material implication** rather than the **logical implication** that is a special case of entailment).

5.1.2. The truth table incorporating this description presents a conditional as false only when its antecedent is true and its consequent is false. This account was first offered in antiquity and has been controversial ever since. Current thinking distinguishes between **indicative** and **subjunctive conditionals**. The latter are held not to have truth tables (but to instead be true when their consequents are true in all the nearest worlds in which the antecedent is true). Indicative conditionals are held to have truth tables even though implicatures obscure this fact.

5.1.3. The rule of the thumb that *if* precedes the antecedent is the key to analyzing English conditionals, but some thought can be required to determine how much of the sentence constitutes the corresponding main clause. English conditionals about the future usually have antecedents in the present tense, so a change of tense is required to obtain an independent component with the correct meaning. When a **branching conditional** is stated in English, the term *otherwise* (which amounts to *if that is not the case*) is often used to state one of the antecedents.

**5.1.x. Exercise questions**

1. Analyze each of the following sentences in as much detail as possible.
  - a. *If it was raining, the roads were slippery.*

- b. *He was home if the light was on.*
  - c. *Ann and Bill helped if Carol was away*
  - d. *Sam will help—and Tom will, too, if we ask him.*
  - e. *If it was warm, they ate outside provided it didn't rain.*
  - f. *If the new project was approved, Carol started work on it and so did Dave if he was finished with the last one.*
  - g. *If he found the instructions, Tom set up the new machine; otherwise, he packed up the old one.*
2. Restate each of the following forms, putting English notation into symbols and vice versa and indicating the scope of connectives in the result by underlining:
  - a.  $A \wedge (B \rightarrow C)$  c. **if** A **then both** B **and if** C **then** D
  - b.  $(A \wedge B) \rightarrow C$  d. **both if** A **then** B **and if not** A **then not** B
3. Synthesize idiomatic English sentences that express the propositions that are associated with the logical forms below by the intensional interpretations that follow them.
  - a.  $\neg S \rightarrow \neg B$   
S: *I'll see it*; B: *I'll believe it*
  - b.  $S \rightarrow \neg (R \vee N)$   
S: *it was sunny*; R: *it rained*; N: *it snowed*
  - c.  $\neg W \leftarrow \neg (P \wedge \neg B)$   
W: *the set works*; P: *the set is plugged in*; B: *the set is broken*
  - d.  $\neg (A \vee B) \rightarrow (G \leftarrow \neg (C \vee D))$   
A: *Adams will back out*; B: *Brown will back out*; G: *the deal will go through*; C: *Collins will have trouble with financing*; D: *Davis will have trouble with financing*
4. Calculate truth values for all components of the forms below on each possible extensional interpretation. Since the first two each have two unanalyzed components, there will be 4 interpretations and your table will have 4 rows of values; with three components, as in the third and fourth, there will be 8 interpretations giving 8 rows of values.
  - a.  $(A \rightarrow B) \wedge (B \rightarrow A)$
  - b.  $\neg (A \wedge B) \rightarrow (\neg B \vee A)$
  - c.  $(A \rightarrow C) \wedge (B \rightarrow \neg C)$
  - d.  $\neg (A \rightarrow C) \wedge (\neg B \rightarrow C)$

**Homework assigned Fri 10/7 and due Mon 10/10**

Analyze: *If they have enough time and enough money for the project, it will go ahead provided it's approved*